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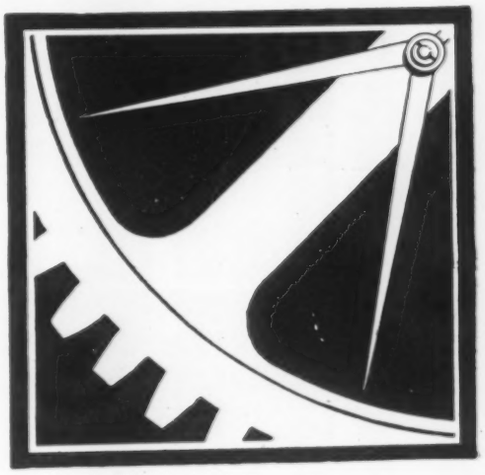
MACHINE DESIGN



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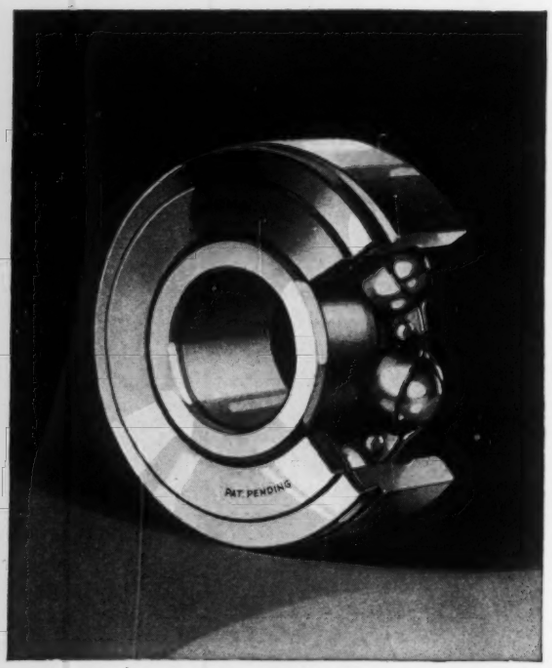
ENGINEERING–PRODUCTION–SALES



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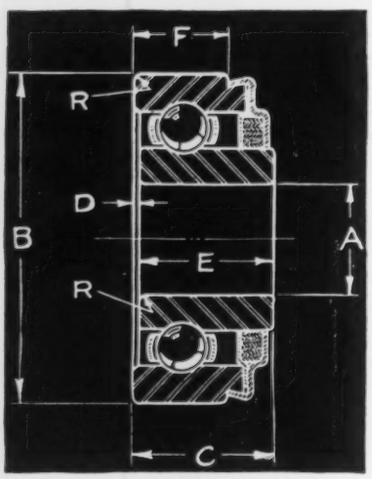

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GS-96	6	.2362	19	.7480	.3543	.016	.3383	.2362	1	.039
GS-97	7	.2756	22	.8661	.4060	.016	.3900	.2756	1	.039
GS-98	8	.3150	22	.8661	.4060	.016	.3900	.2756	1	.039
GS-98246	6	.2362	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-98247	7	.2756	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-9824	8	.3150	24	.9449	.4060	.016	.3900	.2756	1	.039
GS-99	9	.3543	26	1.0236	.4527	.016	.4367	.3150	1	.039
GS-200	10	.3937	30	1.1811	.5118	.016	.4958	.3543	1	.039
GS-201	12	.4724	32	1.2598	.5512	.016	.5352	.3937	1	.039
GS-202	15	.5905	35	1.3780	.5905	.016	.5745	.4330	1	.039
GS-203	17	.6693	40	1.5748	.6693	.016	.6533	.4724	1	.039
GS-204	20	.7874	47	1.8504	.7480	.016	.7320	.5512	1	.039
GS-205	25	.9843	52	2.0472	.7874	.016	.7714	.5906	1	.039

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MACHINE DESIGN

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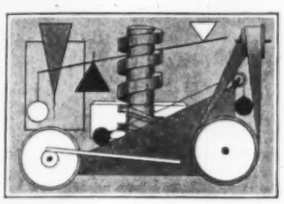
ENGINEERING–PRODUCTION–SALES

Volume 2 **October, 1930** **Number 10**



Next MONTH

AMONG articles scheduled to appear in the forthcoming issue is a contribution by Wm. J. Miskella, Chicago, on the timely subject of machine finishes. With the tendency toward brighter colors which is being increasingly displayed, correct and economical application of paints, enamels and lacquers assumes significant importance.

A wide range of subjects is covered by other articles also scheduled to appear. The issue undoubtedly will be one of the most outstanding numbers published since inception of the journal.

In the current issue, may we draw special attention to the announcement on page 12.

L. E. Jermy
Managing Editor

CONTENTS

	Page
Accessibility in Automatics *By L. E. Jermy*	19
Scanning the Field for Ideas	23
Steel Forgings in Design *By Lawford H. Fry*	27
Shaft Bending Due to Belt and Chain Pulls *By E. H. Hagen*	31
Good Filing Equipment Saves Time and Money *By E. L. Chevraux*	32
Winch Is Designed for Arc-Welded Construction	35
Employing Monel Metal for Machine Parts *By E. C. Badeau*	36
Significant Factors in Choosing a Lubrication System *By L. A. Ballard*	39
Standardization of Motors *By J. L. Brown*	41
Metal Show Reflects Progress	45
Analyzing Types of Bearings Used in Machines *By J. A. Hoff*	46
Professional Viewpoints	48
Progress Made in Design Is Epitomized (Editorial)	50
Miehle Two-Revolution Printing Press *An Illustration by Schroeder*	51
Noteworthy Patents	52
Men of Machines	56
Leaders in Design, Engineering and Research	57
Topics of the Month	59
How Is Business?	62
New Materials and Parts	64
Assets To A Bookcase	72
Manufacturers' Publications	74
Business Announcements and Sales Briefs	78
Calendar of Meetings and Expositions	16

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The Lure of STYLE

. . . for machine designers and machinery buyers

IN NO PHASE of machine design has the lure of style been so evident as in the so-called "modernization" of power drives.

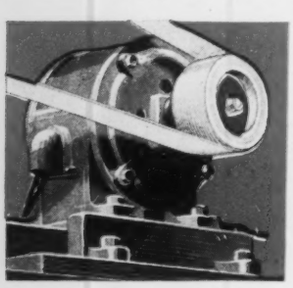
. . . Some machinery builder makes a radical change in the design or equipment of his machine drive. Before it has stood the test of service, it gains some degree of acceptance. Other machinery builders hasten to change their designs. Later they all learn that the change was *not* an improvement.

The competent designer, given full authority and responsibility, will avoid such mistakes before they are made. He refuses to be stampeded by the lure of style. He welcomes suggestions from others in his organization, but he will not accept the snap judgment of unqualified advisors. He thoroughly tests out new methods before he gives them his stamp of approval.

• •

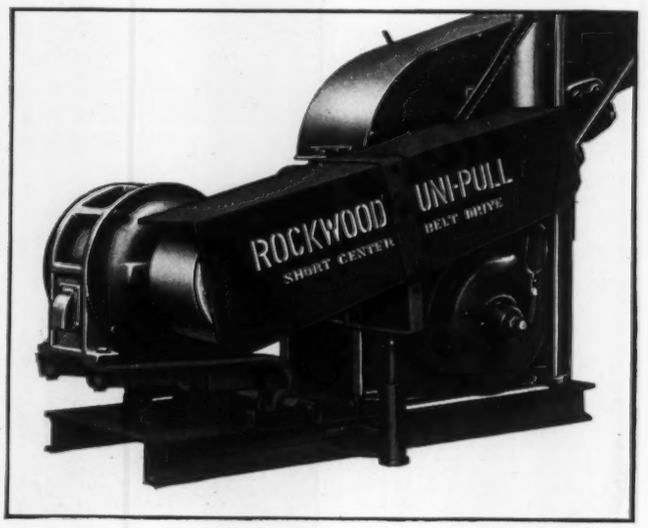
Despite the fact that the flat belt drive continues to be the most widely used form of power transmission (easily three out of every four machines are flat-belt driven), some machinery builders are willing to cast off years of sound engineering practice to blindly "follow the leader."

When *correctly designed and equipped*, the flat belt drive has no equal in simplicity, economy and efficiency . . . It is lowest in first cost! It is easiest to install and maintain! It provides an absolutely dependable flow of power! It automatically absorbs shocks and strains, prolonging the life of both driving and driven units! Above all, the belt drive is *highly efficient*—more so than any gear, chain or V-belt drive, as reliable tests have repeatedly proved.



More than 90% of the belted electric motors in use today are equipped with ROCKWOOD Pulleys. Motor manufacturers prefer ROCKWOOD Pulleys because of their unequalled pulling power and their precision of manufacture which permits high speeds without vibration.

But like other mechanical units, the belt drive must be properly engineered. Its unequalled flexibility—its ability to give reasonable service no matter how carelessly designed—has blinded some designers from appreciating its true value.



ROCKWOOD engineers designed this efficient, compact, flat belt drive, complete with base for easy installation (photo courtesy Papec Machine Co., Shortsville, N. Y.).

• •

By applying study to his belt drives—determining correct speeds and proper belt specifications and selecting the most efficient pulleys—the designer may improve his machine's performance and capacity as much as 25%, or even more! Often the results from this simple precaution are beyond all expectations!

The ROCKWOOD engineers, with years of experience in designing *correct* belt drives, offer valuable assistance to machine designers.

Many progressive designers have profited by the counsel of these experts. Why not get their advice on your problems? There is no obligation. Write today.

• •

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ROCKWOOD
PULLEYS THAT PULL

Itemized Index, October, 1930

Key: Edit, Editorial Pages; Adv, Advertising Pages; R, Right hand column; L, Left hand column

Compiled for the assistance of engineers confronted with specific design problems

Design Calculations:

Belt and Chain Pull, Edit. 31
Equipment for, Adv. 80 L

Design Problems:

Combating Corrosion, Edit. 36, 37, 38
Eliminating Bearing Friction, Edit. 46, 47
Employment of Forgings, Edit, 27, 28, 29, 30, 31
Feeding Material, Edit. 20
Lubricating Bearings, Edit. 39, 40, 47 R 49 R
Mounting Motors, Edit. 44
Providing Accessibility, Edit. 19, 20, 21, 22

Finishes:

Paint, Edit. 64 R

Materials:

Alloys (Iron), Adv. 11
Alloys (Nickel), Edit. 36, 37, 38
Aluminum, Edit. 23
Cork, Adv. 81
Nitralloy, Edit. 25
Rare Metals and Alloys, Adv. 76 L
Steel (Cold Finished), Adv. 61
Zinc, Adv. 85

Mechanisms:

Adjusting, Edit. 21
Clutch, Edit. 20, 22, 25
Feeding, Edit. 20, 53
Suction, Edit. 21 R, 22
Safety Stop, Edit. 22

Organization and Equipment:

Of Engineering Department, Edit. 32, 33, 34, 48; Adv. 77

Parts:

Bearings, Edit. 42 R, 44 L, 46, 47, 52; Adv. 2, 8, 18, 67, 80 L
Cast Parts, Adv. 9
Clutches, Edit. 25; Adv. 14
Controls (Electrical), Edit. 64 R, 66 L, 68 R; Adv. 73
Couplings, Edit. 54; Adv. 4
Drives, Edit. 22, 68 L, 70 L; Adv. 3, 13, 71
Fastenings, Adv. 63
Forgings, Edit. 27, 28, 29, 30, 31
Gears, Adv. 13
Heating Units, Edit. 21 R
Lubricating Equipment, Edit. 39, 40; Adv. 15
Motors, Edit. 41, 42, 43, 44, 70; Adv. 69, 79
Packing Glands and Packing, Adv. 10, 17, 86
Pulleys, Edit. 66 R; Adv. 6
Stampings, Adv. 65
Welded Parts, Edit. 25, 35, 66 R; Adv. 82.

Standardization:

Motors, Edit. 41, 42, 43, 44
Promulgation of Standards, Edit. 60

IT is suggested that those of our readers changing their addresses, inform the circulation department of such change without delay. While we are anxious that subscribers get every copy promptly, we cannot assure delivery unless changes of address are received before the first of month preceeding date of issue.

MACHINE DESIGN
Published Monthly on the Fifteenth

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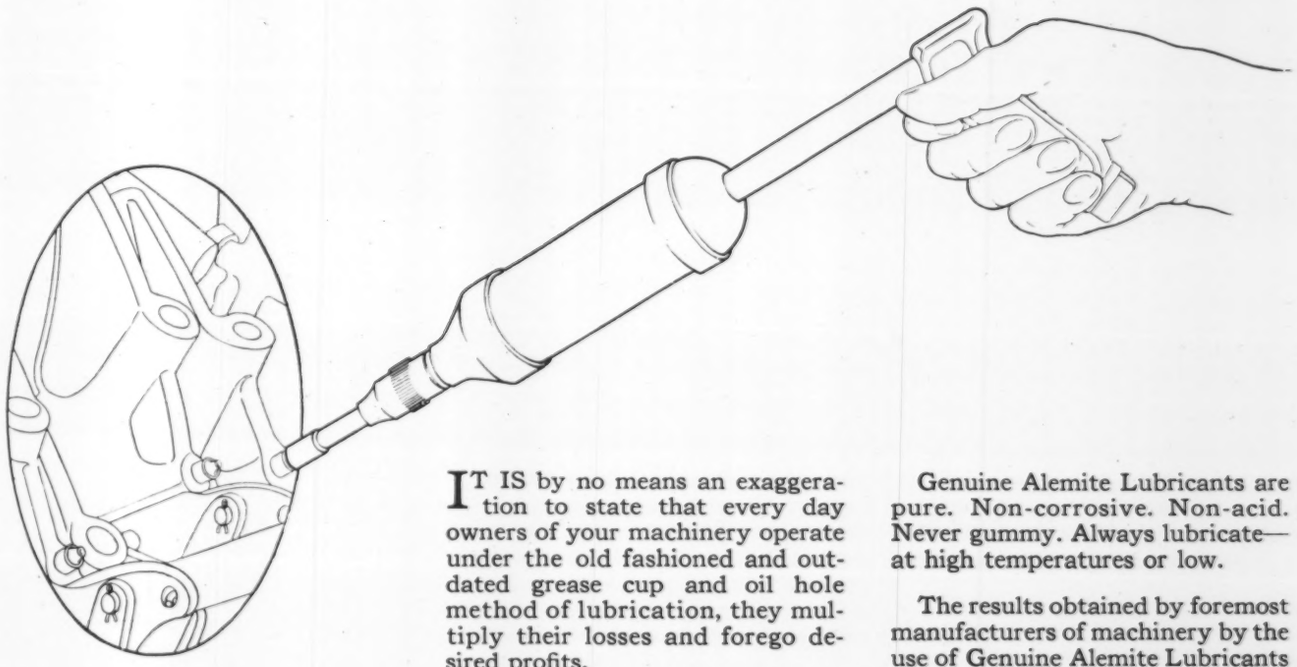

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2. Saves 50% of Amount of Lubricant.
3. Saves 70% of Lubricating Time.
4. Saves 200% on Investment the First Year.
5. Saves in Belting and Other Materials.
6. Saves on Power by Reducing Friction to Minimum.
7. Saves on Cleaning Costs — No Leakage.

IT IS by no means an exaggeration to state that every day owners of your machinery operate under the old fashioned and outdated grease cup and oil hole method of lubrication, they multiply their losses and forego desired profits.

And it is no more an exaggeration to state that every day they operate with inferior lubricants, even with the modern Alemite High Pressure Lubrication Systems, they add to their losses and subtract from their profits.

You cannot compromise with lubrication.

It is either efficient or it is inefficient.

It either saves money or loses money.

Alemite Lubricants for industrial purposes are skilfully and specifically designed for every type of industrial operation. They do *not* "all come out of the same barrel" by a long shot. They are each individually designed for individual manufacturing conditions.

Only by using lubricants of such quality and efficiency can you hold production costs to an irreducible minimum. Only such lubricants can keep breakdowns and repair bills at their lowest point.

Genuine Alemite Lubricants are pure. Non-corrosive. Non-acid. Never gummy. Always lubricate—at high temperatures or low.

The results obtained by foremost manufacturers of machinery by the use of Genuine Alemite Lubricants in Alemite High Pressure Lubrication Systems read like a page from the millenium. But they are true facts — facts which Alemite Corporation stands ready to prove to you *today!*

To merely make the statement that this combination will save its own cost and pay a 200% dividend thereon the first year is not nearly as convincing as to SEE it work out on your own machinery under typical manufacturing conditions. Only after you have proved it to your own satisfaction does Alemite Corporation *ask* you to believe.

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(Division of Stewart-Warner)
2644 N. Crawford Ave., Chicago, Ill.

We want to conduct a lubrication test under actual operating conditions. Send us all information for conducting such a test.

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Address _____

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City _____ *State* _____

267

Calendar of Meetings and Expositions

Oct. 20-25—Ninth Southern Textile Exposition. It is estimated that $500,000 worth of textile machinery and supplies will be exhibited at Textile hall, Greenville, S. C., simultaneously with the semiannual meeting of the Southern Textile association at Poinsett hotel. Approximately 50,000 square feet of floor space will be divided among 200 booths in the hall and indications are that 20,000 visitors will attend. Machinery featuring much new design in the textile industry will be displayed. Those in charge believe that this will be the largest textile show ever held in the country. The exposition will commence formally on the morning of Oct. 20 and will be open until 10 o'clock each evening during the week. The final curtain will be drawn on the event at 6 p.m. Saturday. Members of the textile division of the American Society of Mechanical Engineers will hold their national meeting on Oct. 22 at Poinsett hotel. The afternoon will be devoted to a technical session at which papers will be presented. William G. Sirrine, Greenville, S. C., is exposition manager.

Oct. 20-25—National Electrical Manufacturers' Ass'n. Annual meeting to be held at the Chamberlain-Vanderbilt hotel, Old Point Comfort, Va. The meeting of the casuality and fire prevention committee has been set for Sunday morning Oct. 19. Other sessions include the meeting of the present board of governors on Monday morning, Oct. 20; standards committee, Monday evening; and general meeting of policies division on Tuesday evening. Sectional meetings begin Monday and continue throughout the week. The sectional council is expected to convene Wednesday evening.

Oct. 20-25—Dairy and Ice Cream Machinery and Supplies association. Annual exposition in Cleveland. Roberts Everett, 225 West Thirty-fourth street, New York, is secretary.

Oct. 22—American Society of Mechanical Engineers. National meeting of the textile division at Poinsett hotel, Greenville, S. C., in conjunction with the Ninth Southern Textile exposition. J. B. Mayo is secretary of Greenville section.

Oct. 22-24—Society of Automotive Engineers. National Transportation meeting at William Penn hotel, Pittsburgh. John A. C. Warner, 29 West Thirty-ninth street, New York, is secretary.

Oct. 23—Steel Founders' Society of America. October meeting of society to be held at Pennsylvania hotel, New York. G. P. Rogers is managing director of the society.

Oct. 24—American Iron and Steel institute. Semiannual meeting at Hotel Commodore, New York. E. A. S. Clarke, 75 West street, New York, is secretary of the organization.

Nov. 10-14—Motor and Equipment association. Fourteenth annual show to be held at Cleveland public auditorium. A convention will be held in conjunction with the exposition.

Nov. 11-14—National Association of Practical Refrigerating Engineers. Annual convention and exhibit to be held at Hotel Peabody, Memphis, Tenn. Edward H. Fox, 5707 West Lake street, Chicago, is secretary of the organization.

Dec. 1-6—American Society of Mechanical Engineers. Fifty-first annual meeting to be held at the Engineering Societies building, New York. Calvin W. Rice, 29 West Thirty-ninth street, New York, is secretary of the society.

Dec. 3-6—American Society of Refrigerating Engineers. Annual meeting at Hotel New Yorker, New York, during week of ninth national exposition of power and mechanical engineering. David L. Fiske, 37 West Thirty-ninth street, New York, is secretary.

Dec. 1-6—National Power Show. Ninth national exposition of power and mechanical engineering to be held in Grand Central Palace, New York. Exhibits will show the latest developments in the most effective and economical methods of producing, increasing and applying power to present-day requirements. During the same week the annual meetings of the American Society of Mechanical Engineering and American Society of Refrigerating engineers will be held at the Engineering Societies building and Hotel New Yorker, respectively. Management of the power show is under the direction of Charles F. Roth and Fred W. Paine, with offices in Grand Central Palace, Lexington avenue, New York.

Jan. 10-16, 1931—American Road Builders association. Twenty-eighth annual convention and road show to be held in St. Louis. The opening day has been set aside for distributors and manufacturers, thereby leaving Jan. 12 as the date of the official opening.

Jan. 26-30, 1931—American Institute of Electric Engineers. Annual winter convention to be held in New York. F. L. Hutchinson, 33 West Thirty-ninth street, New York, is secretary of the organization.

Feb. 16-20, 1931—Western Metal congress. Second National Western Metal congress and exposition to be held in Civic auditorium, San Francisco, under the auspices of the American Society for Steel Treating. W. H. Eisenman, 7016 Euclid avenue, Cleveland, is secretary.

MACHINE DESIGN
October 1930

Accessibility in Automatics

By L. E. Jermy
Managing Editor, Machine Design

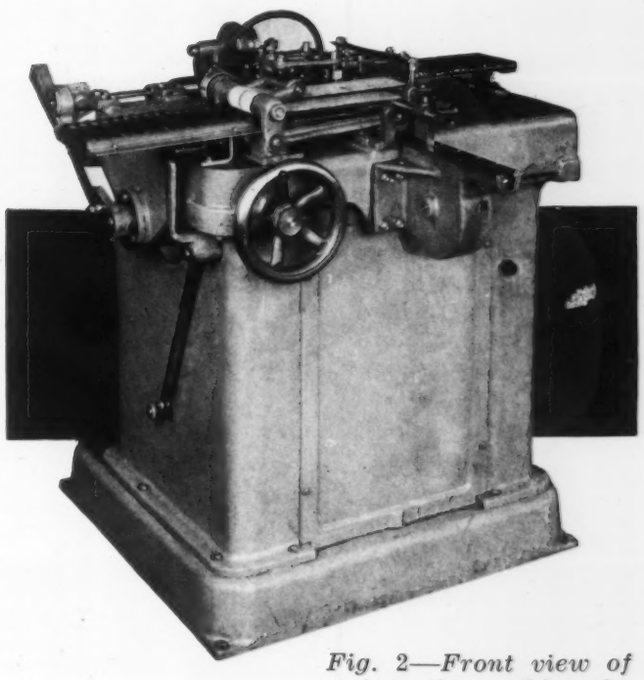


Fig. 2—Front view of automatic machine designed to load 70 cigars per minute into transparent pouches. All adjustments are located above machine bed

RAPIDLY operating automatic machinery usually involves necessarily complex movements, with the result that one of the major considerations of the engineer responsible for design of such machinery should be directed toward the establishment of satisfactorily accessible locations for the more intricate motions that are incorporated in his designs.

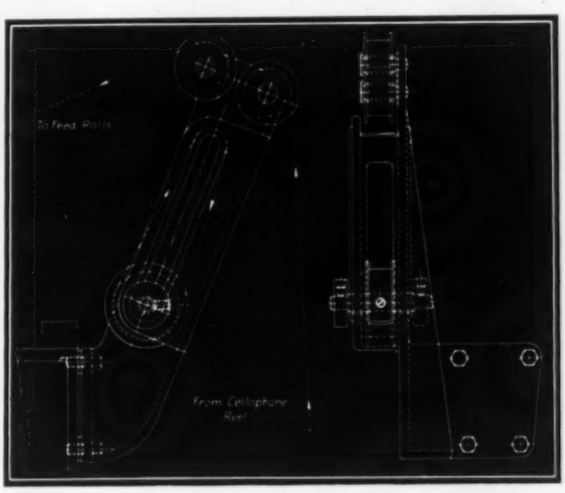


Fig. 1—Compensating device for feed

A good example covering design of automatic machines from the aspect of accessibility of parts and mechanisms is disclosed by a machine developed by the Dobeckmun Co., Cleveland, for enveloping freshly made cigars in transparent material. Cellophane is used for enclosing the cigars, and as many as 70 cigars per minute can be packaged on this machine.

In this connection it is of timely interest to note that for some years efforts have been made by numerous machinery builders to develop machines for this purpose. These have culminated in several types being produced which are adapted to the use of Cellophane. Employment of foil, as used formerly for the same purpose, appears to have decreased considerably, one of the reasons undoubtedly being the greater merchandising value obtainable by the use of a transparent container, and another the preserving characteristic of the moisture proof material.

Reverting to the contention that machinery of this type should be designed for accessibility,

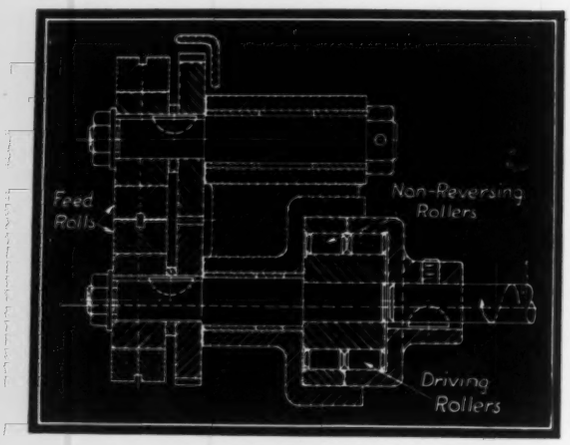


Fig. 3—Redesign of feed clutch incorporating nonreturn rollers. Principle is same as employed in earlier design

it does not follow necessarily that all working parts actually be exposed. Suitable guards, often removable in an instant, can be provided. These, besides protecting the mechanism, serve also as a means of furnishing protection for the operators. An additional advantage is that appearance of most machinery is enhanced greatly by the use of correctly designed guards.

In the Dobeckmun machine, illustrated in Fig. 2, all the mechanism actually employed in enclosing the cigars is mounted on top of the machine bed, the operating mechanism only being beneath. Consequently the cigars readily are visible during the whole of the operations of enclosure and sealing.

Sequence of Operations Outlined

Before proceeding to a discussion of the many interesting features incorporated in the design, and in order to enable the reader to follow more easily the later description, it is proposed to outline the procedure during the passage of cigars through the machine. At the same time it should be explained that on this machine the cigars, strictly speaking, are not wrapped but are fed into pouches cut from a reel of Cellophane which previously has been fabricated into an endless tube and reeled on another machine in flat or "plicated" form.

As will be seen from Fig. 2, the cigars are fed into the "loading" or enveloping machine (usually from a cigar banding machine) on a feed table at the end of which is a pair of canvas feed belts. Each cigar as it reaches the loading position is pressed forward by a feed plunger into the Cellophane pouch. Cigar and open-ended pouch then are moved to the sealing station, the ends are sealed and folded under and the wrapped cigar passes on to the discharge table.

The pouch, as mentioned in the foregoing, is cut from a reel, the reel being mounted on a stub shaft at the rear of the machine and rotated by the pull exerted by two feed rolls, shown in Fig. 3, between which the material passes. Intermittent feeding is employed in order to allow time for the pouch to be cut from the tube and to clear before the tube again is fed forward. For the intermittent feed it is of course necessary to incorporate some form of compensating device to take up the slack which is apt to arise in the Cellophane and also to ease the tension on the material when the feed rolls commence rotating. This is accomplished by the device shown in Fig. 1 which illustrates the line of travel of the material around two idler rollers and also around a compensating roller which is permitted to slide up and down in the slots provided. As the pull is exerted on the Cellophane by the feed rolls the compensating roller rises. It drops gradually by gravity when the pull ceases, and while dropping draws more material from the reel for the next feed movement.

It was considered desirable, in an experimental model of the machine, to utilize one steel feed roll and one rubber. This idea quickly was abandoned however as positive feeding was not assured. Rubber rolls were adopted having a hard rubber center and softer pure gum on the outer diameter.

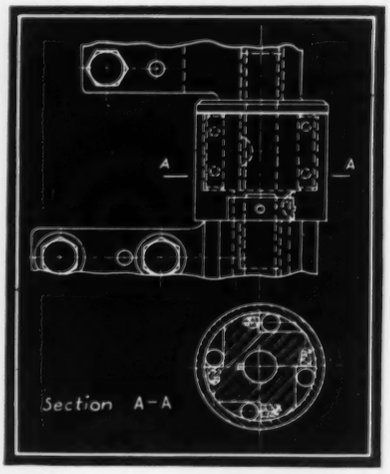


Fig. 4 — Early design of one-way clutch employed for obtaining intermittent movement of feed rolls. Some slippage and backlash occurred. Clutch therefore was redesigned as shown above

Design of the clutch for the feeding mechanism and also of the adjustment device for the feed is extremely interesting. Originally a one-way clutch as illustrated in Fig. 4 was tried but this proved unsatisfactory due to the tendency toward nonpositive action and also to the liability for the feed rolls to rotate backward on the return stroke of the rack employed for the feed. A new clutch therefore was designed, as illustrated in Fig. 3. This embodies, as shown, a set of driving rollers which operate on the principle disclosed by the sectional view A-A of Fig. 4, and also a nonreturn set of rollers employing the same principle but acting in the opposite direction of rotation. The outer ring for the latter set of rollers is set solidly in the

housing. Behind each roller, for both the forward and reverse clutch, a light spring is used to hold the rollers always in contact with the locking surfaces and thus eliminate any possibility of lost motion forward or slippage backward.

In connection with the adjustment device for the feed rolls, considerable difficulty was experienced in early models due to the fact that adjustments could not be made with the machine running. One of these earlier feed cranks with the original design of adjuster may be seen in Fig. 2, a later photograph of the machine not being available. The later design is shown in Fig. 5, from which it will be noticed that instead of adjustment being obtained by changing the center distance between the crank pin and center of shaft, an oscillating lever is provided to permit change of feed by varying the position of the fulcrum.

Adjusts Feed Without Stoppage

The fulcrum stud for the lever, (at the upper end of which is pivoted the feed rack) is slidably mounted in a stationary block through which passes the adjusting screw. It will be seen that this arrangement provides an efficient method for making changes in the feed without stopping or even slowing up production—a feature not found in the usual type of crank feeding mechanism. It also is interesting to note that this provision for adjustment, as well as that for other adjustments on this machine, is located above the machine bed and therefore is accessible readily.

After passing between the feed rolls, the flattened Cellophane tube is directed by upper and lower wire guides over a knife block and thence into a channel guide having a stop at the far end. The stop is provided to prevent the material, as it is cut off in this position, traveling farther by momentum. When cut, the pouch, still in the flattened condition, remains in the channel guide until the lower suction head comes into action and draws it down along its entire length. The suction head then passes with the pouch to the position at which the cigars are deposited in the containers, this being in reality the loading station.

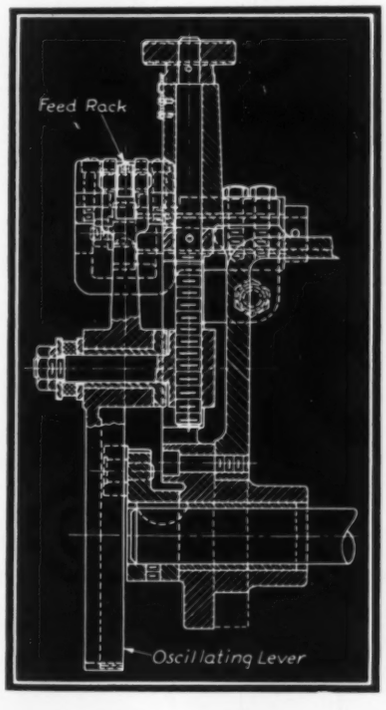


Fig. 5 — Redesigned adjustment or measuring device for feed. Originally the single crank arrangement shown at left of Fig. 2 was used. Desirability for making adjustments without stopping machine led to the redesign. Fulcrum for oscillating lever is moved away from or toward crank by vertical adjusting screw

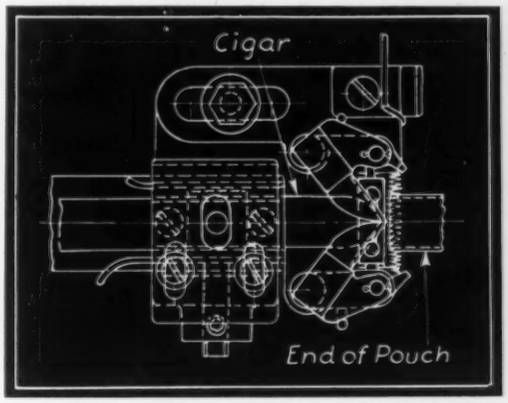


Fig. 6—Specially pivoted funnels for facilitating entry of cigar into pouch

At this station the upper suction head is lowered nearly to the pouch. The suction is applied, the head rises and in so doing draws with it the upper panel of the pouch. At the same time an air blast is directed into the rear end of the pouch to assist in opening it up.

Pivoted Funnels Facilitate Entry

As the cigar is fed forward by the plunger referred to previously it passes between two funnels which are shaped and pivoted as indicated in Fig. 6. The pivots for the funnels are so located as to permit them, as the cigar passes between, to enter the end of the pouch and to open it to circular form. In their fully open position the funnels extend about ⅜-inch into the pouch and remain in that position until the entire lengh of cigar has passed through. These funnels permit free entry of the cigar into the pouch and also prevent slippage of the cigar band. The funnels are returned by means of light springs to their closed position to await the next cigar.

With the cigar inserted in the transparent tube the suction to the upper and lower suction heads is shut off and the partly wrapped product is indexed forward to the sealing stations. At the first station the ends of the Cellophane, projecting about ⅜-inch beyond the ends of cigar, are nipped or pressed between the upper heating units and lower plates shown in Fig. 7. These plates are opened and closed at the sealing end

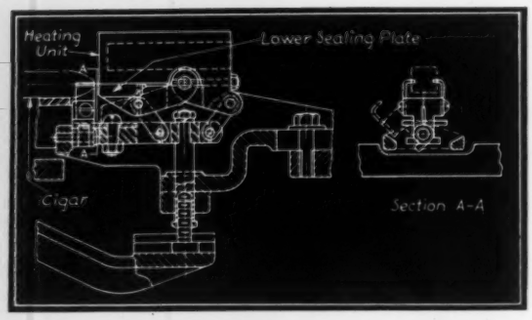


Fig. 7—Heating element and side tuckers operated by movement of stud

through a neat linkage operated by the up and down movement of the single vertical stud. At the same time the side tuckers shown in full and dotted lines in section A-A also are opened and closed. In the closed position the tuckers are in contact with the Cellophane at the fold and prevent crumpling or splaying of the material during the sealing process, thus assuring a neat fold. The noteworthy feature of this mechanism is that all the final motions are effected and controlled by vertical movement of the one stud.

Following the tucking and sealing operations the cigar is drawn by the indexing mechanism to the final station. At this point the sealed ends are folded and tucked under the cigar. These final folds remain under the ends of the cigar due to the bends being made in the Cellophane while still hot and setting in that position during cooling. The indexing mechanism brings the cigars successively through the sealing and folding units, and finally passes them along to the discharge table.

To drive the machine a motor of one-half horsepower is used. The motor shaft passes, through a coupling, directly into the rotary air pump which creates the suction necessary for handling the pouches between the upper and lower suction heads. This same shaft extends to an adjustable friction clutch and on to a reduction gear from which the machine drive is taken. Adjustment of the clutch is such that slippage will of course occur in the event of overloading the machine.

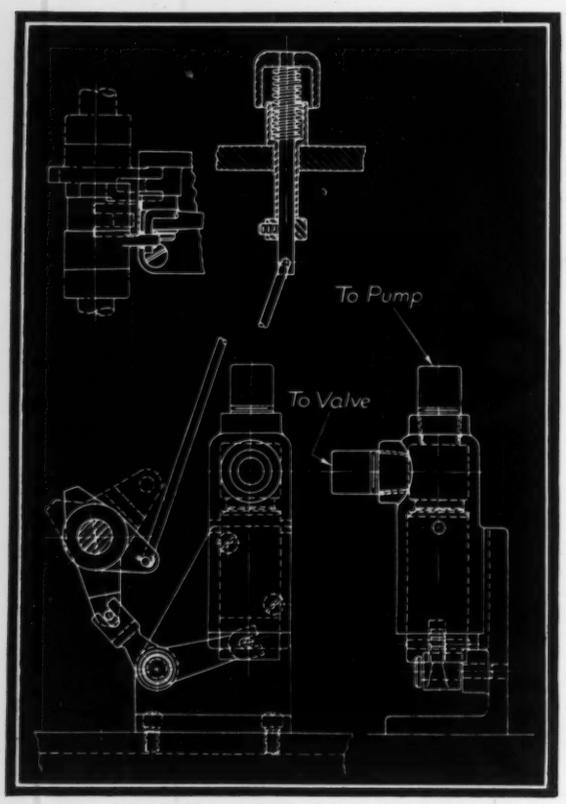


Fig. 8—Suction valve which throws out clutch automatically on decrease or cessation of suction used for pouches

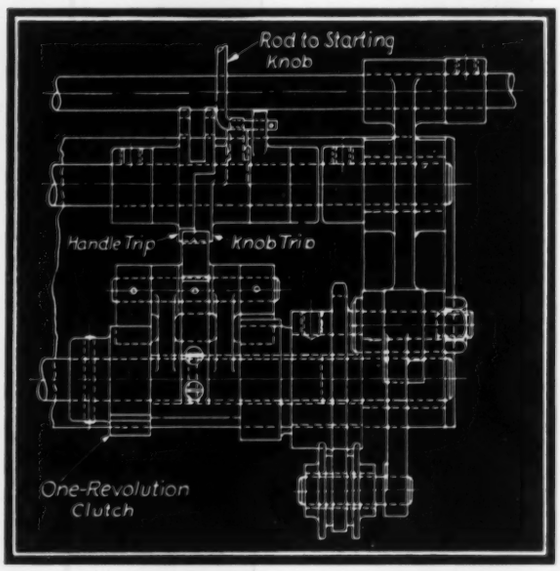


Fig. 9—Plan of clutch mechanism showing separate operating trips in stop position

An interesting automatic "knock off" is incorporated in the one-revolution starting clutch mechanism (Fig. 9) mounted on the slow speed driving shaft of the machine. The throw-out device is shown in Fig. 8. Standard starting handles are provided at both the front and rear of the machine. The clutch is operated not only by these handles, but in case of the suction failing entirely or in the event of a pouch for some reason becoming misplaced on the suction heads, with consequent drop in suction, the clutch is operated immediately by the valve shown in Fig. 8.

In the body of the valve a close-fitting plug is inserted which is raised by the suction to such a position that the lever connection at its base holds a clutch trip out of position and permits the clutch to drive continuously. On the cessation of suction this plug falls by gravity and in doing so sets the clutch trip in the stop position. The machine cannot again be started until the starting knob seen at the top of Fig. 8 is pressed down by hand to raise the plug into its position in valve cylinder, this resetting clutch.

SCANNING THE FIELD FOR IDEAS

A Monthly Digest of New Machinery, Materials, Parts and Processes, with Special Attention to Significant Design Features and Trends

EMPHASIS is placed on the rapidly increasing employment of aluminum and its alloys in a statement made recently by R. S. Archer of the Aluminum Co. of America. Mr. Archer mentions that the world production of aluminum has grown from almost nothing in 1885 to approximately 500,000,000 pounds per year at the present time.

It is not many years since the production of other nonferrous metals such as copper, zinc and lead stood at a similar figure. Aluminum, however, is one of the most abundant metals in the earth's crust, constituting about 8 per cent, and the large available ore supplies together with the inherent adaptability of light metals in modern civilization point unerringly to an enormous future production of this metal.

Many of the more recent applications of aluminum command the attention and consideration of engineers in numerous fields, particularly in cases where the metal is used to replace steel or other materials. An instance of this is found in the design of a crane fabricated almost entirely from aluminum members which recently was built by the Northern Engineering Works, Detroit. An illustration of this is shown in Fig. 1.

The crane bridge is of latticed type girder construction and is the first bridge of this type built for crane purposes made entirely from aluminum alloy rolled sections. The design not only accomplished a saving in headroom but reduced considerably the weight of the structure under what it would have been with conventional steel plate girder construction. It is said that the total net weight of the crane is 30,000 pounds whereas a steel structure of similar capacity would weigh 77,100 pounds.

Lubricator Embodies Unusual Motion

AN UNUSUAL mechanical movement is incorporated in the type DS1 mechanical lubricator developed by Nathan Mfg. Co., New York, a general sectional view of which is disclosed in Fig. 2. The object of the movement is to transfer rotary motion of the input shaft to partial turning and sliding movement in the plungers which are employed in these lubricators to eliminate the use of valves. The plungers are operated by a shaft common to all shown at 11, Fig. 4, in such a manner that each plunger by its upward movement and simultaneous turning motion opens and closes automatically the suction channel, and by its downward movement opens and closes the delivery channel. The action is positive, thus rendering certain the delivery of oil.

In order to obtain the necessary turning and sliding movement of the plunger shaft, the head of the main drive shaft 1 is provided with an eccentric recess, as shown at 2, adopted to receive the extended spherical portion 3 of a crosshead 4. The crosshead is secured by means of a taper pin to the crosshead pin 6 which is

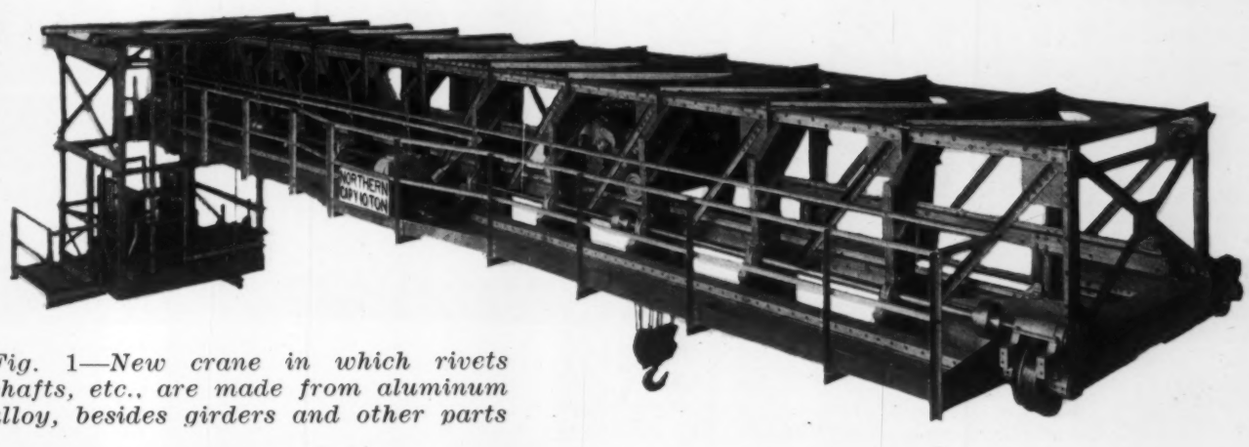


Fig. 1—New crane in which rivets shafts, etc., are made from aluminum alloy, besides girders and other parts

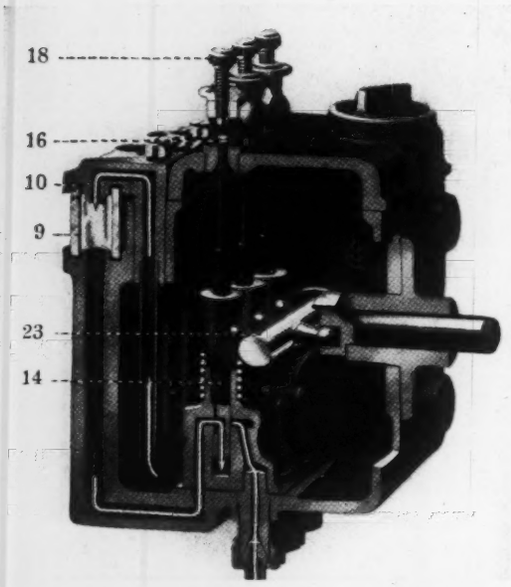


Fig. 2—Cutaway view of lubricator

capable of sliding and rotating in the lug element 7 and in another lug (not shown) of the driving shaft casing. The ball arm 9 is secured by a taper pin to the plunger shaft, also capable of sliding and rotating in the bracket 12 and in a second similar bracket not shown. This ball arm is provided with an extended spherical portion 13 which engages in a recess formed in the crosshead as shown.

The ball and recess construction shown undoubtedly has innumerable applications in design where conversion from rotary to semirotary and sliding motion is necessary.

Four-Crank Press Is Developed

TO MEET the requirements of the automobile industry in particular, a new type of four-crank, double crankshaft press has been developed by Marquette Tool & Mfg. Co., Chicago. The presses provide four-point suspension and four-point stress application to the die holding slide. Fig. 4 shows an illustration of the new machine.

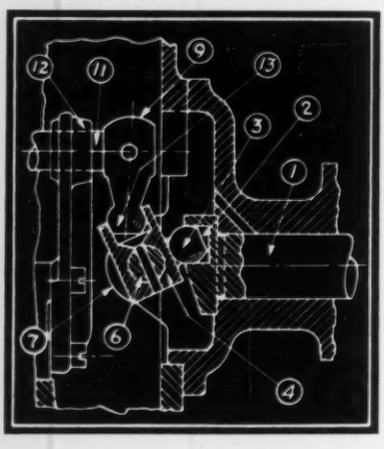


Fig. 3—Section of lubricator mechanism which converts rotating motion of driving shaft into partial turning and sliding motion in the plunger shaft

The two crankshafts are driven synchronously in opposite directions from a motor-driven mainshaft through herringbone gears running in oil. Each crankshaft has two cranks, with the four connecting rods employed connecting with individual slide blocks incorporating a synchronized adjusting mechanism. The slide blocks in turn connect to the slide at each of four points, spaced in such a manner as to reduce the maximum area of die surface over which the stress from each crank must be distributed.

An unusual feature of the new presses is in the method of vertical slide adjustment to eliminate spacer or bolster plates for die location. Each connecting rod is attached to a block locked in the guide by means of a pin through the block. The block in turn is provided with the adjustment screw, bearing against the buttress plate. The entire adjusting mechanism is enclosed, and the arrangement is such that all bending moments on the adjusting mechanism are eliminated.

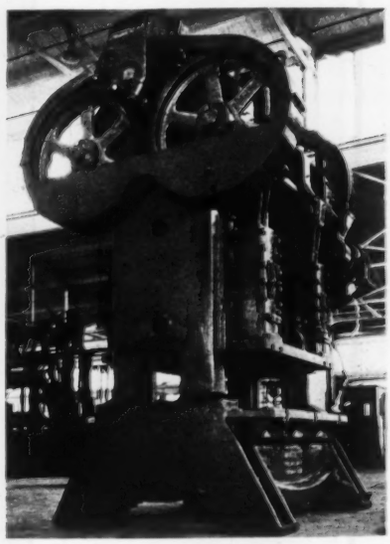


Fig. 4 — New type press incorporating two crankshafts having two throws on each shaft. By this arrangement it is possible to reduce considerably the stresses arising in presses in the stamping of very large parts

Another feature is the provision of two air tanks mounted on the crown of the press to counterbalance the weight of slides and dies. These cylinders are connected to the main air supply through a reducing valve to adjust the air pressure in the tanks according to the weight to be counterbalanced and are controlled by a single reducing valve. The air cylinders are of the closed system type, there being no exhaust of air to the atmosphere.

Rotary Pump Has Nitrided Parts

NITRIDED steel is receiving consideration from engineers in many fields of design, among the more recent applications being its employment for the crankshafts of engines. By nitriding the bearing sections of a shaft, it has

been found possible to eliminate the usual inner race of antifriction bearings and to run the balls or rollers directly on the shafts.

Wearing parts of many other mechanisms also are being nitrided successfully. Another instance is found in the rotary oil pump developed by the Evans Appliance Co., Detroit, for use on automobile, marine and aircraft engines, which is shown in section in Fig. 5. The shaft, vanes, and rotors all are of nitralloy steel, hardened by the nitriding process.

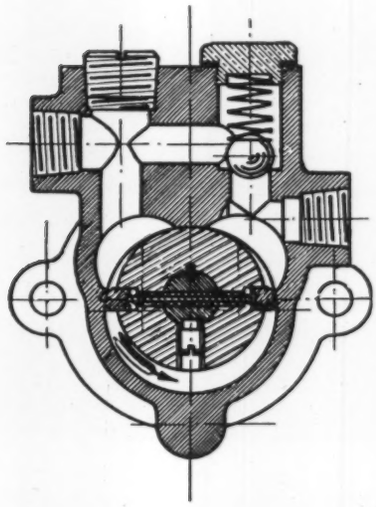


Fig. 5—Rotary fuel pump in which all wearing parts such as rotor, vanes and shaft are fabricated from nitralloy steel and hardened by the nitriding process

Barrel-Pin Connection in Coupling

AN UNUSUAL type of flexible coupling, shown in cutaway view in Fig. 6, recently has been developed and patented by C. O. Thomas, Grand boulevard, Montreal. The drive is taken through barrel shaped pins fitted closely in holes bored half their diameter in the hub flanges of the coupling and half in the casing flanges.

Each casing, near its end, is machined to a cylindrical bore, these bores being a sliding fit on the spherically curved perimeter of the flanges on each of the hubs. The longitudinal radius of curvature of the driving pins is concentric with the spherical formation of the flanges.

The driving pin holes, after drilling, form pairs of mating semicircular recesses in the hubs and casing. Pins are held against axial sliding in the hub recesses by shoulders and retaining rings but, with the hubs, are free to slide in the longer recesses of the casings. Drilling and reaming is employed for each pin hole, with the hub assembled to a push fit inside its mating half casing.

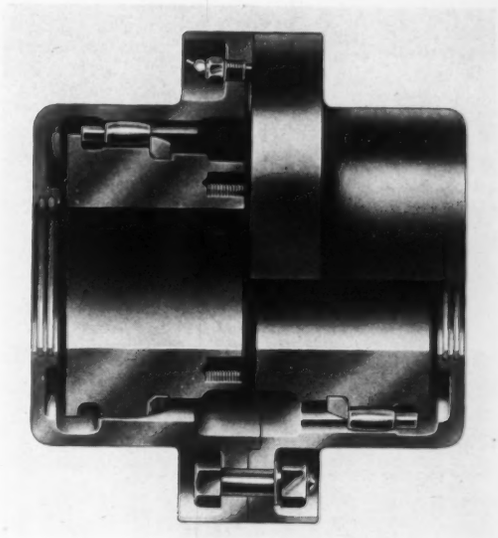


Fig. 6—Flexible clutch embodying barrel-shaped pins as drivers

Tool marks then are made to ensure that the hub and half casing always are put together in the same angular relation to each other. Accuracy of pitch therefore is not essential.

No backlash is possible in the coupling, due to the pins being a close sliding fit in their holes. The device therefore is suitable for machinery in which backlash is a disadvantage, and particularly for reversing services. Misalignment of 3/32-inch in the 2-inch shaft size up to ½-inch in the 12-inch size is permissible.

Welds Parts of Drilling Machine

EXAMPLES of the successful employment of arc welding constantly are being disclosed, another instance being found in a 49-spindle drilling machine introduced recently by the Moline Tool Co., Moline, Ill., and shown in Fig. 7. The machine base is a flat piece of boiler plate

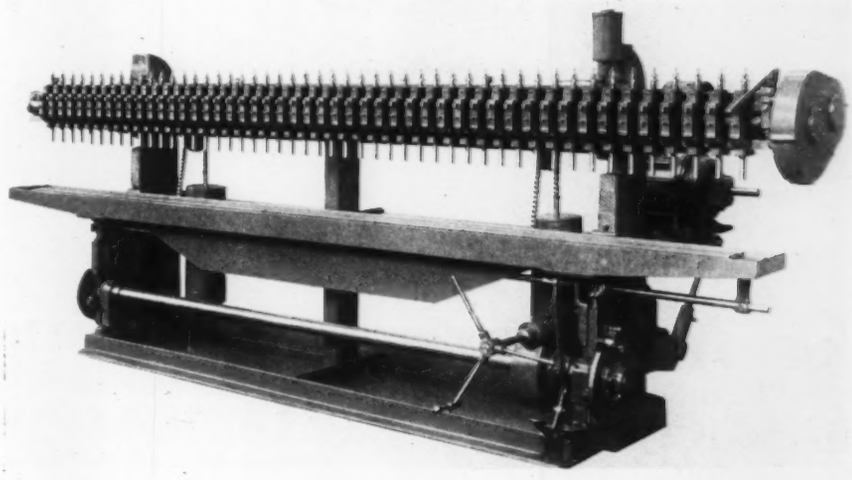


Fig. 7.—Majority of parts on this drill are arc welded

with angle irons welded along the edges to give stiffness. Both ends of the base are built up with small box section pads for the convenience of bolting on the cast iron end frames. The table is an I-beam, the web furnishing the bottom of the water pan, and ends being closed by plates welded in place. Welded cross members furnish the pads for mounting the knee, and cast iron sections are bolted and welded in the center to provide the T-slotted working face. A rib is welded beneath the entire table unit, providing the required rigidity.

The rail on which the 49 spindles are mounted is constructed of H-section welded to a large piece of boiler plate. Gray iron castings are fitted into the H-beam and bolted and welded in place, forming the necessary shape for mounting spindle units and giving continuous bearing for the main driving spiral. This unit is machined after all welding has been completed. The rail is tied to the base by an angle iron which gives added strength to the entire machine.

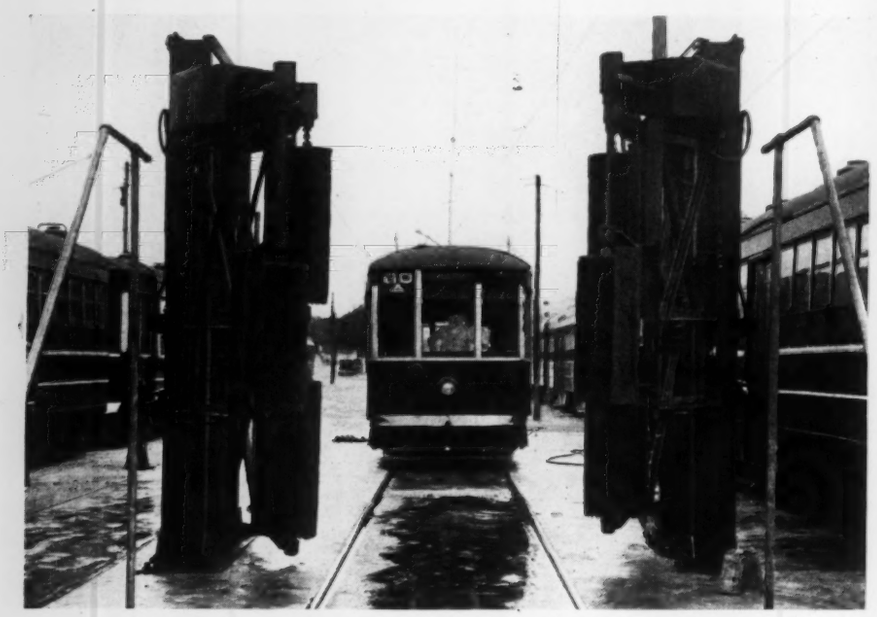


Fig. 8—Refining the street sweeper—a new trolley cleaner

Unique Car Washer Is Designed

RESEMBLING the street cleaning machine to some extent in its operation, but with numerous refinements in design added such as automatic starting and stopping, the machine shown in Fig. 8 has been developed by Leeds, Tozer & Co., New York, for washing cars, etc.

The machine consists of two steel uprights, erected on each side of the track. To these uprights are attached swinging arms at the free ends of which are rotating brushes driven by electric motors mounted on top of the arms. On the side of the machine from which the car approaches are two vertical standpipes pierced with holes through which water sprays to drench the car prior to the scrubbing operation and at the rear ends of the machine are additional spray pipes for rinsing the car after it has been scrubbed.

The electric motors and the water valve are actuated automatically by means of a switch inserted in the trolley wire so that the entering car starts the motors and the water, and at the conclusion of the washing operation a similar switch shuts off the motors and the supply of water.

Research Discloses New Alloys

AMONG new alloys recently introduced which probably will have a significant bearing on design, is a material containing cobalt, nickel and ferrotitanium known under the trade name "Konel." Originally developed for use as a filament in radio tubes, it is said to be a satisfactory substitute for platinum for many uses.

One of the remarkable properties of the alloy is that it is harder than steel even when red hot. It is surpassed only by the diamond in hardness and will cut a screw thread in a glass rod, machine porcelain and retain a keen edge.

High tensile strength, light weight and corrosion resistance are properties of an alloy developed by the Drekolias International Corp., New York. The alloy is composed of aluminum, zirconium, copper, iron and tin. Tensile strength is given as 31-32 tons per square inch, with a brinnell hardness of 112. Specific gravity stands now at 2.12 but it is hoped by further research to reduce this to 1.7.

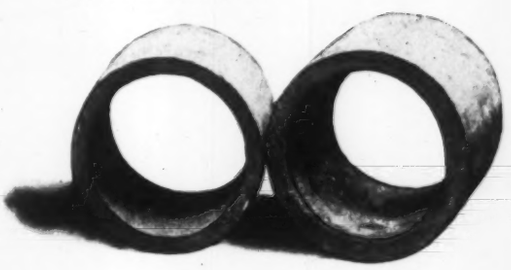
A new American standard for symbols for photometry and illumination just has been adopted by the American Standards association. The new standard is a modification of the American standard for illuminating engineering nomenclature and photometric standards adopted in 1925. A national standard for navigational and topographical symbols also has been approved as American tentative standard by the American Standards association.

These standards are part of a comprehensive program under the auspices of the American Standards association for the unification of graphical symbols, symbols for quantities in equations and formulas, and of abbreviations as used in engineering and scientific reports, tables, and publications.

Second Section of a Three-Article Series

Steel Forgings in Design

Fig. 1—Sleeves for brass extrusion work



By Lawford H. Fry

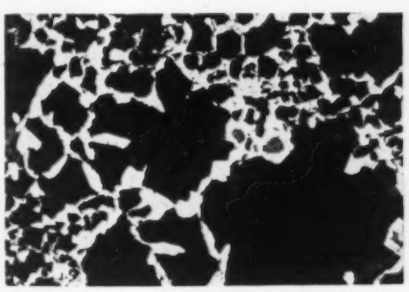
IN this, the second section of the series of articles by Mr. Fry, Edgewater Steel Co., Pittsburgh, the author deals comprehensively with production and heat treatment of forgings. He presents however only such information as is considered to be of assistance for correct application of forgings in design work.

TRANSFORMATION of the ingot into the forging is the next step to be considered in production and subsequent employment of forgings. In some specially large forgings this takes place in a single step. The ingot is reheated after solidification and is forged under a hydraulic press to the form desired. Usually though, the ingot is rolled down to a billet or bloom of a rectangular cross section and the billet is reheated and forged to shape after surface imperfections have been chipped out. For tonnage production the ingots are taken from the molds while still at a red heat and are placed in furnaces or "soaking pits" where they are held at a temperature of from 2000 to 2200 degrees F. until they are rolled. This conserves heat and accelerates production.

Some makers of forgings of special quality stress the fact that they produce the billets by forging the ingots to billets under a press. This practice has the advantage that the ingots are allowed to cool to at least a black heat before being reheated for forging, thus ensuring complete solidification throughout the ingot. When the ingots are transferred at a high temperature to the soaking pit there is a possibility that the steel in the center of the ingot may not be completely solid before rolling takes place. Billets rolled from an ingot having a mushy, semisolid center will be of inferior quality. All the evidence available indicates that the type of mechanical power used to reduce the ingot section to the billet section does not play an important part in determining the quality of the forgings to be produced. With a given quality of steel and with equal care in heating and in the rate of reduction it will be immaterial to the quality of the billets whether they are produced from the ingot by rolling, pressing or by hammer forging.

Though the type of machinery used in reducing the ingot to the billet from which the forging is shaped is not particularly important, the amount of reduction and the rate at which it is carried out both have considerable effect on the properties of the forging.

Consider first the amount of reduction. It has been pointed out that the ingot is not of an entirely uniform structure. As the ingot is



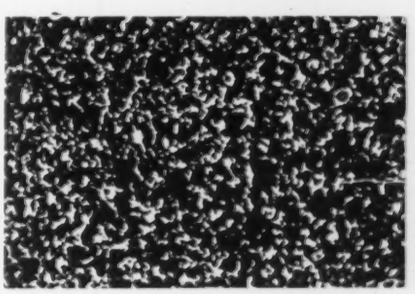


Fig. 2—(Left) and Fig. 3—(Right)—Photomicrographs of carbon steel forgings containing 0.50 carbon and 0.64 per cent manganese. Large irregular grains in Fig. 2 show heat treatment has not been properly carried out. In Fig. 3 the treatment has been effective and grain structure is uniform

TABLE I

Composition of Various Forging Steels

Types of Steel	Plain Carbon, Per Cent	Carbon Nickel, Per Cent	Carbon Vanadium, Per Cent	Chrome Vanadium, Per Cent	Chrome Nickel, Per Cent
Carbon	0.48	0.25	0.48	0.38	0.35
Manganese	0.60	0.90	0.88	0.60	0.60
Silicon	0.20	0.20	0.20	0.20	0.20
Nickel	.....	2.75	.....	.....	1.25
Vanadium	.....	.....	0.18	0.18	.....
Chromium	.....	.....	.....	1.00	0.80

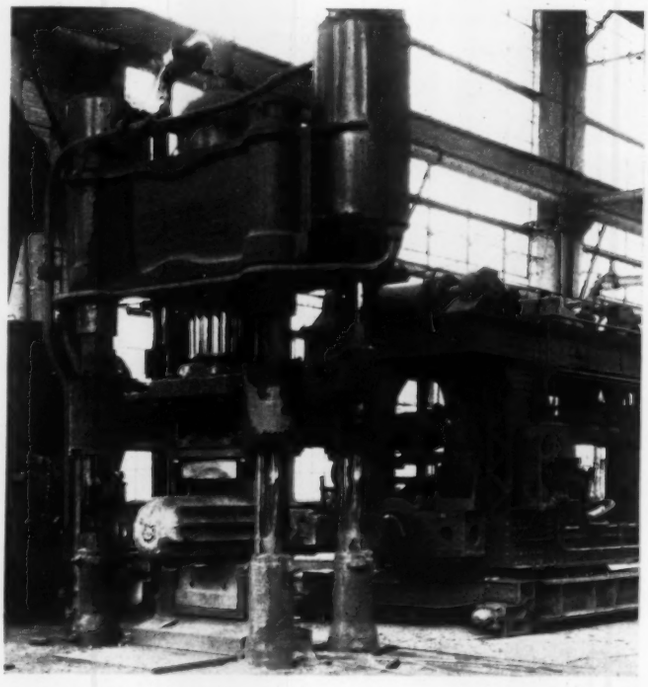
Note: The figures given represent average compositions such as will be used in working to the specifications current for the different grades of steel. The maximum and minimum content of the various elements will vary from the average figures given by approximately the following amounts: Carbon 7 points, manganese 10 points, silicon 5 points, nickel 20 points, vanadium 2 points and chromium 15 points.

rolled or forged down to a billet the cross section is reduced and the structure is elongated in a direction parallel to the longitudinal axis of the ingot. This elongation of the diversities of the structure produces fiber in the steel. In the ingot the irregularities of structure do not have any uniform position and the strength and ductility of the steel are about the same in all directions. As the structure is elongated the cross section of the irregularities is reduced, they are drawn out in the longitudinal direction and the fiber thus produced causes a considerable difference between the longitudinal and the transverse properties of the steel.

The difference in the properties will be greater, the greater the fiber, and the amount of fiber will depend on the heterogeneity originally found in the ingot and on the amount of reduction given. In a coarse, poorly made ingot a considerable reduction will be necessary to produce satisfactory properties in the longitudinal direction and the improvement in longitudinal properties produced by a large reduction will be obtained at the expense of the transverse properties. The proper amount of reduction to be given between ingot and forging will depend on the kind of stresses to which the forging is to be subjected.

In the case of hollow forgings subjected to hoop stresses such as those applied by internal pressure as in ordnance or similar forgings the transverse stresses are the most important. Since forging reduction impairs the transverse properties, it is essential in such hollow forgings to keep the reduction from the ingot as low as possible. At the same time it will be desirable to have the steel as uniform as possible. Both these requirements point to use of small ingots.

If the stresses are predominantly longitudinal as in the case of an axle subjected only to flexure it is not necesary to limit the amount of reductions, but it is well from the point of view of production costs to recognize that there is no advantage in an undue increase in reduction from ingot to forging. It formerly was usual in forging specifications to have a requirement that the reduction from ingot to billet should be not less than 4 to 1 and that there should be a reduction of at least 40 per cent from billet to forging. This meant that the cross sectional area of the ingot must be at least 6 to 7 times the cross sectional area of the forging to be produced. An investigation made by a subcommittee of the American Society for Testing Materials showed recently that there was little to be gained by having the ingot section more than three times the section of the forging.



Photograph, courtesy American Locomotive Co., New York

Fig. 5—Thousand-ton steam hydraulic forging press. Electric manipulator at right is holding 24-inch ingot in position

Fig. 4 — Quenched and tempered nickel-chrome - molybdenum-vanadium steel, showing extremely fine desirable grain structure. Magnification, 100 diameters

In the foregoing the making of the steel and the forming of it into the ingot or billet from which a forging is to be made is considered. It now is in order to consider the manufacture of the forging. This includes the forging of the steel by press or hammer into the shape desired, the heat treatment of forgings, together with a study of physical properties and test methods.

The methods used in bringing the forgings

to the shape desired may be classified under three heads; Hollow forging; Plain forging; and Drop or die forging.

Hollow forgings comprise large special forgings such as drums for oil cracking stills, large rings for turbine and electrical machinery, special large pipes, etc. Such forgings usually are forged direct from the ingot. An ingot of the appropriate weight and cross section is cast and allowed to cool, and the top and bottom discard are cut off cold in a large parting lathe. The central axial portion of the ingot then is bored out or trepanned. The ingot is heated, a mandrel inserted and the forging operation carried out. For such forgings acid steel generally is preferred to basic as it is finer grained, and is freer from injurious oxides and inclusions. It therefore is less fibrous and better able to stand transverse stresses. As this method is used only for forgings of large size hydraulic presses generally are employed.

Method Employed Is Immaterial

What has been classified above as plain forging is intended to cover all that body of forgings which are brought to shape from an ingot or billet by external pressure from a steam hammer or hydraulic press. No difference need be made between the two tools, the press and the hammer, because if all other things are equal the mechanical means used for displacing the metal will not affect the final quality of the forging. In saying this it is assumed that the tool used, either press or hammer, is proportioned properly to the work to be done. If too light a hammer is used for a large forging the flow of the metal may be concentrated too much on the outside of the steel. On the other hand a powerful press if used too brutally may cause internal ruptures in the steel. The larger forgings not infrequently are forged direct from an ingot, but the great majority of these plain forgings are shaped from square billets for round work, and from rectangular billets for flat work. Large round forgings, such as locomotive driving axles and shafts, frequently are bored after forging to remove the weak core and to reduce the section of metal through which the heat treatment must penetrate.

Drop or die forging which may include work done in forging machines is used only for smaller forgings which are to be produced in quantity. The cost of making the necessary dies will determine the largest size and the minimum number of forgings which can be made economically by this process.

All forgings of any size or importance require a heat treatment of some kind after forging. Before describing the various methods of heat treatment and their effects it is desirable to say a few words regarding the metallurgy of steel as disclosed by the microscope.

If a piece of plain carbon forging steel is

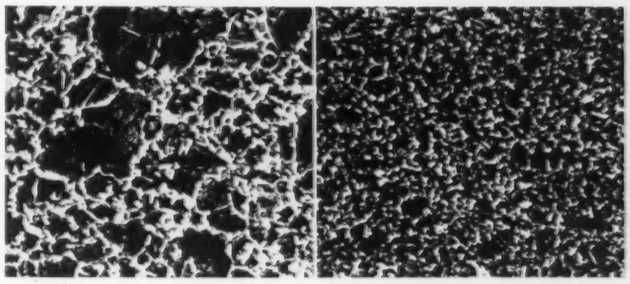


Fig. 6—Normalized carbon steel forging containing 0.45 carbon and 0.70 per cent manganese. At left, heat treatment has been poor, leaving irregular grain structure. At right, desirable degree of grain refinement indicates excellent heat treatment. Magnification 100 diameters

taken from a forging before any heat treatment and is highly polished, lightly etched with dilute nitric acid and examined under a microscope with a magnification of 100 diameters the structure will appear as shown in Fig. 7 (First section, in September issue). It is made up of a large white net work with the meshes filled with a darker structure. The white material forming the net work is known as "ferrite" and in plain carbon steel is practically pure iron. The darker material filling the meshes is "pearlite" and with a higher magnification will be seen to be made up of thin layers of iron carbide, known as 'cementite,' sandwiched between other layers of ferrite. The ferrite is comparatively soft and the cementite extremely hard.

The large irregular mesh work of the steel in the "as forged" condition, is poorly adapted to resist the stresses encountered in service. The large grains give poor cohesion and the irregularity of structure tends to concentrate stresses at the weaker points. To obtain satisfactory results it is desirable to have a fine uniform arrangement of the grains. This can be obtained

TABLE II

Tensile Properties

Normalized and Tempered Steels:

Type of Steel	Yield Point, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area Per Cent
Carbon steel:				
(a) High tensile ..	47,000	87,000	24	40
(b) Low tensile	44,000	82,000	27	46
Carbon-vanadium	62,000	98,000	25	45
Carbon-nickel	59,000	84,000	29	62

Quenched and Tempered Steels:

Type of Steel	Elastic Limit, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation, in 2 In., Per Cent	Reduction of Area Per Cent
Carbon steel	56,000	96,000	23	45
Chrome-vanadium	70,000	108,000	22	56
Chrome-nickel	70,000	108,000	22	56

Note: The values given are average values which would be obtained in working to specifications now current for the various types of steel. Maximum and minimum values would vary from the values given by about 5 per cent of these values. For composition of the steels see Table I.

in various degrees by the different methods of heat treatment. Structures obtained with various steels and various treatments are shown in the accompanying microphotograph.

The effect of heat treatment depends on the fact that when steel is heated to a temperature above what is known as the "critical temperature" or the "critical range," all of the iron carbide is dissolved in the iron and instead of being divided into ferrite and pearlite the mass is uniform, and is known as "austenite."

Grains Increased with Rise in Temperature

Though of uniform composition the austenite has a granular structure at a temperature just above the critical range the grains are small, but they increase in size as the temperature to which the steel is heated is increased. When the steel cools again through the critical range the austenite separates again into ferrite and cementite. The condition of the structure after cooling will depend on the distance to which the temperature has been carried above the critical range and the rate at which the steel is cooled through the critical range. With a temperature just above the critical the austenite will be fine grained and the steel cooled from this temperature will tend to retain this fineness of grain. Too high a temperature will give a coarse-grained austenite and a tendency to coarseness of grain when cooled.

If the steel is cooled slowly through the critical range there is time for the ferrite and cementite to separate out and the structure will have somewhat the appearance of that of the "as forged" condition, but with smaller and more regular grains. There will be a ferrite network, and the pearlite in the meshes will consist of broad plates of ferrite inclosing the plates of cementite. The steel will be soft, ductible and free from internal stress. If the steel is cooled rapidly the separation of the ferrite and cementite will not have time for its completion. The grains will be fine and the structure of the meshes will not be discernible except under a high magnification. The steel will be hard, brittle and highly stressed internally. Intermediate rates of cooling will produce intermediate effects. It must be emphasized that it is the *rate* of cooling and not the *method* of cooling which determines the properties given by the treatment. The fact that a forging is quenched in oil or in water is not in itself important. The steel is not affected by the quenching but by the rate of cooling that is produced. This will depend on the size of the forging as well as on the cooling medium used. A small forging may cool in the air more rapidly than a large forging quenched in oil, and in this case if they both have the same composition the small air-cooled forging will be harder than the large oil-quenched forging.

The kind of heat treatment to be used for a given forging will depend on the type of steel used, on the size and design of the forging, on the physical properties desired and on the service for which it is intended.

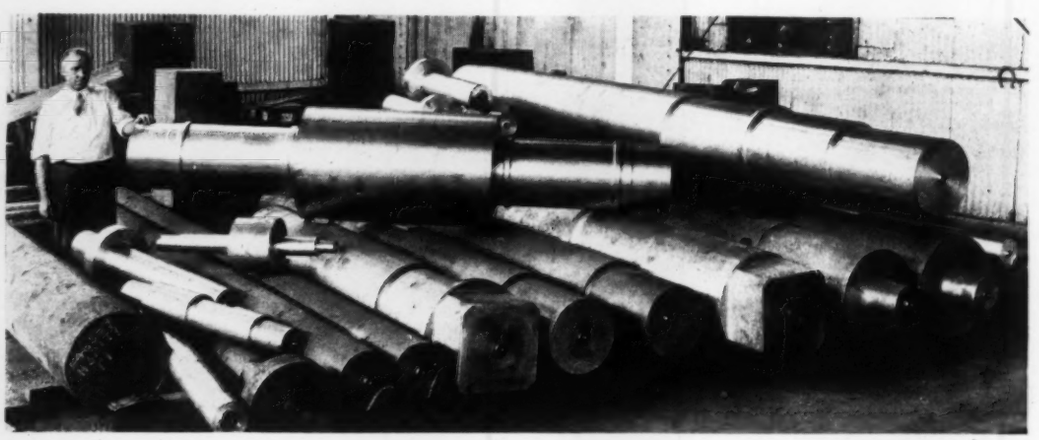


Fig. 7 — Miscellaneous smooth forged and rough turned shafts and rollers of carbon and alloy steels

Photograph, courtesy Heppenstall Co., Pittsburgh

Plain carbon steel forgings not subject to severe stresses well may be used in the annealed condition. Special carbon steel forgings for more severe service and special alloy steels such as low carbon, one and one-half per cent nickel steel and carbon vanadium steel frequently are normalized and tempered. Many such forgings are used for driving axles, crank pins, connecting rods, and similar parts.

Quenching Sets Up Internal Stresses

Where greater strength is required carbon or alloy steels are used in the quenched and tempered state. The application of quenching however, is limited by the size and design of the forging. During the quenching operation the surface of the forging in contact with the quenching medium is cooled rapidly while the center remains hot. A temperature gradient thus is set up between the center and the surface. The surface contracts while the interior

holds the expansion corresponding to its high temperature. As a consequence internal stresses are set up in the forging. In the case of forgings of small diameter or thickness the temperatures equalize out rapidly and the stresses do not become unduly high. In forgings of large section the temperature difference will be large and the stresses may become so high as to rupture the forging. A similar difficulty is encountered with a forging having light and heavy sections in combination. During quenching the light sections cool and contract more rapidly than the heavy sections. Drastic quenching as in water produces more rapid cooling than an oil quench and therefore aggravates the liability of a forging to crack during quenching.

If round forgings such as axles or shafts over six inches in diameter are to be quenched it is good practice to bore out the center before quenching. This increases the surface through which heat is extracted by the quenching medium and also reduces the section through which the heat has to flow, thus reducing materially the temperature gradient and the stresses set up.

For shafts subject to bending or torsion the diameter of the bore may be with advantage approximately one-half the outside diameter. This reduces the weight twenty-five per cent and the strength only six and one-quarter per cent.

Shaft Bending Due to Belt and Chain Pulls

By E. H. Hagen

WHERE a shaft failure may have serious consequences it is well to check the shaft for static strength and proper factor of safety based on fatigue strength. With belt drives the total belt pull must be computed, which is equal to the numerical sum of the total belt tensions on the tight and loose sides of the belt, if the belt pulls are parallel (180 degrees belt contact). If the belt pulls are not parallel, the total pull on the shaft is the algebraic or vectorial sum of tensions. However, the computations usually are of sufficient accuracy if the pulls are considered as being parallel and the numerical sum used.

Equation (1) gives the relation between the tight and loose tensions of a belt drive:

$$T_1 = T_2\, e^{.01745f\alpha} \qquad (1)$$

In this,

T_1 = total tension on tight side
T_2 = total tension on loose side
e = 2.718
f = coefficient of friction between belt and pulley
α = angle of belt wrap in degrees

Also to transmit a given amount of power the effective pull (T_1—T_2) must equal a given amount. This is given in the equation:

$$T_1 - T_2 = \frac{P \times 33{,}000}{S} = \frac{P \times 126{,}000}{Rpm \times d} = \frac{2t}{d} \qquad (2)$$

Where

P = horsepower to be transmitted
S = belt speed in feet per minute
Rpm = pulley revolutions per minute
d = pulley dia. in inches
t = torque in inch-pounds

Substituting the proper values of f and α in equation (1) and solving simultaneously with (2) values of T_1 and T_2 are obtained; or the same sum of T_1+T_2, which is the result desired, can be obtained from the following:

$$T_1 + T_2 = (T_1 - T_2)\frac{e^{.01745f\alpha} + 1}{e^{.01745f\alpha} - 1} \qquad (3)$$

where T_1—T_2 has been obtained from equation (2).

Equation (3) can be written:

$$T_1 + T_2 = (T_1 - T_2)\, K \qquad (4)$$

and if the usual values of f=0.30 and α=180 degrees are substituted in (3) we find that K in (4) equals 2.26. That is with the assumed values of f a total belt pull of 2.26 times the required effective pull will satisfy the conditions of our problem. It is obvious then that the initial tension in the belt need only be such that the total pull is 2.26 times the required effective pull.

When belts are installed, however, the initial tension seldom is measured. It usually is greater than required. Therefore it is better to assume some larger value than 2.26 for K. A well known ball bearing manufacturer assumes that K in equation (4) is equal to 2.5 and a roller bearing maker uses the higher value of 3. Another maker of roller bearings assumes K as being 2 for a single belt, 2.5 for a double, and 3 for a triple leather belt.

Approximate values of the total belt pull (T_1+T_2) may be obtained by multiplying the width of a single leather belt by 105 pounds and the width of a double belt by 165 pounds. For tractor belt drives the total pull is assumed as 200 to 250 pounds per inch of width across the belt.

In the case of chain drives the tension on the slack side often is assumed to be zero and therefore the tension on the tight side equals the effective pull. However, when checking shaft strength or when computing bearing loads it is not safe to neglect chain weight or the impact due to chain whipping. To provide for such increment forces the total pull may be taken as 1.25 times the effective pull of the chain.

Good Filing Equipment Saves Time and Money

By E. L. Chevraux

INADEQUATE files and filing systems contribute largely to the annual waste of thousands of dollars through the destruction of valuable drawings. Mechanical improvements have been produced in modern filing equipments, which are many in design and of varied types. The reason for multiplicity of design is apparent when it is admitted that different business enterprises, by the nature of their drawings and the use to which they are put, require varying systems and kinds of filing cabinets. Practically every type on the market today merits careful consideration before a decision is made as to the one which will best suit particular needs. In fact, such an investigation sometimes is a necessity if that which eventually will prove to be the most economical is to be secured.

In this connection it might be well to note that occasionally it is real economy to pay a higher price for specially built cabinets which embody desired features taken from several different "stock" cabinets. The peculiarities of individual requirements might suggest other and original features which also may be incorporated, if considered necessary for the efficient handling of the particular problem. To sight one example of this thought, the writer is of the opinion that a special cabinet containing small individual drawers, as shown in Fig. 1, is preferable to a stock cabinet with large drawers, (see Fig. 2), subdivided to accommodate drawings of a given size—this viewpoint being contingent upon the assumption that there is the necessity for frequent reference to such files by many file clerks or other authorized persons.

In such a case it is obvious that the smaller drawers easily could be removed to a handy reference table, thereby permitting several clerks to work simultaneously on one section. Furthermore, these drawers would be built to the desired size to suit the drawings, while on the other hand if tracings were not of a size consistent with the so-called "standard"—of necessity arbitrarily set by the manufacturer of the stock cabinet—the subdivisions would be either too large, with consequent shifting of drawings and greater liability of tearing in handling, or the adjustable subdividers would have to be placed to measurements which would cause waste space on one or both sides of each drawer.

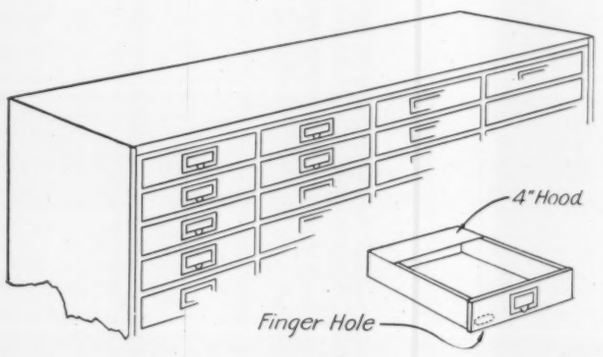


Fig. 1—Small drawers, as used in this type cabinet, may be removed to reference table

Finger-Hole Assists Selection

Still further advantages could be gained by providing each small drawer with a hood or top guard at the rear to prevent tracings "crawling" over to the back of the cabinet and becoming torn or "lost." In addition to this a finger-hole could be placed in the bottom of each individual drawer at the left-front corner as shown in the illustration for the purpose of lifting tracings up from the bottom instead of digging down from the top until the desired part number is reached. Incidentally, this latter feature has proved to be of considerable help in the preservation of drawings. Hundreds of other examples could be cited in an effort to prove the fact that the cheapest initial cost is not always the most economical, especially when the drawings are in constant use.

Certain large manufacturers of business filing equipments have developed subsidiary organizations for the purpose of making surveys in industrial, commercial, financial and governmental institutions, with a view to advising what equipment would best suit their needs. The research work of

these efficiency experts advanced the designing of many printed forms and filing cabinets for use in connection with systems which they have set in motion. Many years of such investigations, experiments and observations have brought us to more or less standardized methods of handling practically every kind of a record except drawings. In spite of the fact that their services are gratis to the prospective purchaser, it is a matter of record that very few engineering departments have ever extended an invitation to such organizations to make a survey and recommendations for betterments.

Standardization Has Been Neglected

For this reason many specialists have little interest or training in the matter of handling of drawings. Consequently, standardization in this line has not been given as much thought as it deserves from the manufacturers of filing equipment. In proof of which I quote from a recent inquiry of one manufacturer awakening to the necessity of action in this matter: "Although we are one of the largest manufacturers of drafting room furniture in the world, our own actual experience in this field is limited and, consequently, we want to obtain as much information as we can from men who have made studies of this work and who would be in a position to make recommendations of worthwhile value."

As previously stated, the nature of drawings in different industries requires various types of filing equipment, but there now is a movement on foot at least to standardize methods in kindred organizations. With proper co-operation of all concerned, these efforts will bring gratifying results, not the least of which will be an interest taken by the filing cabinet manufacturers to the end that their salesmen will be supplied with data which will assist them in making intelligent recommendations instead of as at present, advocating the use of whatever equipment their respective organizations fabricate as a stock product, regardless of whether best suited to that particular use or not. May I not suggest that there is great need for the organization of a clinic to make a collection of all the available material on this subject, followed by an extensive study of drawing filing practice.

Individual Requirements Govern Selection

Frequently the writer is the recipient of inquiries through the mail, such as: "What kind of vertical filing equipment do you recommend?" Again I am forced to repeat that circumstances make for a variety of necessities, each problem requiring separate treatment. Invariably, in the case of such questions it is better to delay definite answer until furnished with a *detailed* list of conditions surrounding that particular problem. Roughly, the statement should include at least information regarding sizes of drawings, volume of each carried in both active and inactive files, frequency of usage, sketches of present files, available floor space, kind of business, etc. In some cases it might not be advisable to use "vertical" equipment, but even if it were, I would be guilty of following a practice complained of earlier in this article, if recommendation were made without first taking into consideration the adaptability of a certain manufacturer's product to the case in hand.

The purpose of this part of the contribution is not, therefore to advance the claims of the "pet" product of any special company or group, but rather to infuse the idea of exercising extreme care and thought in the problems of systematic filing cabinet installations. With these thoughts in mind I am refraining from injecting

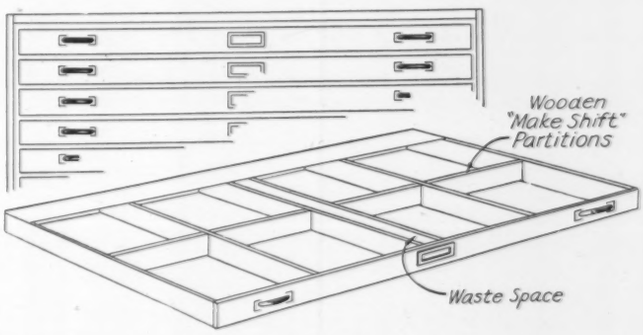


Fig. 2—Providing subdivisions in large drawers is apt to lead to wastage of space

illustrations into this article showing any "stock" cabinets. It is logical to assume that practically all those interested in this phase of the subject already have in their possession descriptive advertising matter and catalogs covering the various equipment marketed at the present time. However, for the benefit of those who may not have such material available, following is a brief outline of latest developments.

The majority of steel filing cabinets are preferable to wooden ones because of their indestructible qualities and resistance to atmospheric changes, obviating the sticking and binding of drawers. Their fire retardent as well as rodent and vermin proof qualities also serve as good recommendations.

Properly designed and processed horizontal "plan-drawer" files offer a dust and moisture proof construction in which drawers are provided with hoods at rear and double-hinged compressor flaps at front, or flexible "blanket" protectors, preventing tracings slipping out of place and insuring their being subjected to a minimum of curling, crumpling and tearing. These features also prevent friction between contents of a drawer and the bottom of the drawer above. Some drawers are fitted with a

so-called tracing lifter. When a drawing is either to be inserted in or removed from file, all those tracings on top of the desired location are folded over this device, which is hinged in a novel manner and swung upward to the rear of the drawer, thereby facilitating easy handling of the objective tracing.

Vertical filing equipment for drawings roughly may be subdivided into four types, the first being the method of filing small tracings on edge, encased in open folders and placed in standard letter-size or cap-size vertical drawer files. This system is identical with common practice in correspondence filing but, for obvious reasons, is not practical in institutions where almost constant reference is made to many thousands of tracings. "Box" drawer files, as shown in Fig. 1, are preferable for housing small tracings.

INTENSE interest displayed in Mr. Chevraux's first section of this two-article series, which appeared last month under the title "Preserving Valuable Drawings", prompts the belief that the ideas and suggestions embodied in this contribution also will receive deep consideration from, and will be invaluable to, engineering department executives.

Following are descriptions of the other three types of vertical filing equipment, all of which are designed primarily to accommodate large drawings. Some advantages are: little floor space required, less weight per cubic foot of cabinet, less cost per cabinet housing a given number of tracings, elimination of necessity to climb or stoop in the operation of these cabinets and the fact that one lock covers a greater number of drawings than in any other type of file.

Folders Filed in Compartments

The first design is a box-like cabinet with a hinged lid on top. Inside are vertical compartments, between which are coil springs acting as compressors. Approximately one hundred tracings may be placed in each paperoid open folder, indexed at the top and filed in the compartments. Entire contents are suspended in space and do not come in contact with inner wall of cabinet at any point. These cabinets have a capacity of about 5000 tracings of maximum sizes 48 x 36 inches and 56 x 24 inches and may be secured in single or double-wall constructions, the latter with asbestos linings for fireproofing. They offer absolute protection against water in case of fire. This type is the only one not enjoying the necessity of fasteners or binders at the top of tracing.

The second design is a closed cabinet with double doors opening at the front. Individual drawings or groups are clamped at the top edge in metal binders which are tightened with screws operated by special keys. These binders are hung on a rack which may be pulled out of the top of cabinet for this purpose; racks are equipped with a ball bearing suspension device which greatly increases ease of operation. These files accommodate approximately 2600 tracings of maximum size 48 by 70 inches. Each binder carries a large size label holder for indexing. Open folders may be placed around each group, in an inverted position, for protection of drawings.

The third type may be secured in a variety of sizes, either in a skeleton framework or a closed cabinet fitted with swinging doors. The basis of this system is a flexible clip consisting of a celluloid stiffening strip enclosed in cloth, a portion of which is coated with an india rubber adhesive for applying to one edge of the drawing. These clips are of a "loose leaf" construction, having a slit leading from the outer edge to a small hole. They are snapped over horizontal rods in top of cabinet, thus producing a vertical suspension of tracings. Each tracing is handled individually but they may be grouped in file through the medium of indexed separators. Clips will pass through all blueprint machines without injury and the extra thickness will not affect sharpness of adjacent lines on blueprint reproductions of tracings to which they are attached.

Filing Extra Large Drawings

It is common practice to file extra large drawings rolled up, in which case a "pigeon-hole" cabinet is employed. These units are procurable in a wide variety of sizes, some with open fronts and others fitted with swinging, sliding or disappearing type doors as well as roller curtains, to exclude dust and moisture and act as a fire preventive. All of the latter may be equipped with locks if desired.

Much of the above mentioned equipment may be housed in fireproof safe cabinets which are designed to withstand jar in falling, in case of serious fire, or the crushing effect of collapsing walls of a building.

Wisdom dictates that the volume of drawings found in the average engineering institution today represents a valuation great enough to warrant housing them in a fireproof building or separate class "A" vault. The original cost of construction of the latter should be considered cheap insurance against the possibility of prohibitive costs, both in money and time, in the matter of replacement in case of fire loss or damage by water. Even if a vault is not available at the present time, any specially designed cabinets should be built in sections small enough

to permit passage through a standard vault door.

One element entering into the present necessity for huge variety in filing cabinet designs is the fact that there is a like variation in sizes of drawings adopted as "standard" by different companies. In fact it is common for variations in this respect to exist between two or more drafting departments in the same organization. At least one of the larger drafting room supply houses is campaigning the adoption of some standard size which will effect the greatest saving in cutting sheets of bond paper, vellum, tracing cloth, etc. from roll stock of standard widths. As rolls of blueprint and vandyke papers are marketed in these same widths, it is suggested that a saving in waste may be made in reproduction work also. The prevailing trend, wherever changes are made or new standards adopted, is toward 8½ x 11 inches. The larger sheets run in multiples of this size, with a slight decrease in the large sheets to allow for folding blueprints to this base size, which is identical with the universally standard letter head. Standardization in this matter will tend eventually to bring about a concentration on a lesser number of sizes and types of filing cabinets, thus encouraging improvements and attendant decrease in cost through the stimulation of wider competition on a standardized product.

Winch Is Designed for Arc-Welded Construction

AN excellent example of the use of arc-welded steel construction is given in the accompanying illustration, Fig. 1. In the winch shown, welded construction replaces cast iron from which the base and majority of parts in earlier designs were made.

The winch is a product of the Youngstown Welding and Engineering Co. of Youngstown, O. It is 5 feet long by 4 feet 6 inches wide, weighs 1840 pounds and exerts a power of 10,000 pounds at 60 feet per minute. Standards steel shapes cut to size and shape and joined by the welding process are used throughout. Among the welders employed by the manufacturer are several "Stable-Arc" welders built by Lincoln Electric Co., Cleveland.

Half-inch plate is used in making the base of the unit. In the corners, a means of bolting the winch securely to the floor is provided by welding drilled pieces of bar stock in place, as shown. The gear housing and the support for the drum and niggerhead mounted on the base are of ⅜-inch plate. Stiffeners on the sides of the gear housing which distribute the weight and stresses to the base are ⅜-inch plate, 1½-inch wide. Covers for the gear housing, not shown in the photograph, also are constructed of ⅜-inch plate.

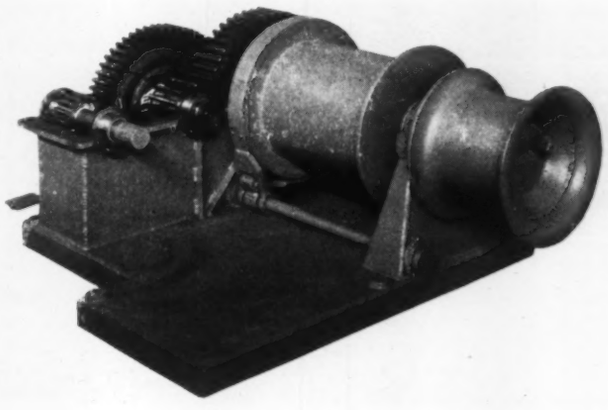


Fig. 1—Winch of arc-welded design

The drum of the winch is formed by rolling plate into cylindrical form and welding a circular bead into place, as shown. On the head nearest the gears a piece of flat stock is rolled into a circle and welded to the head as part of a brake assembly.

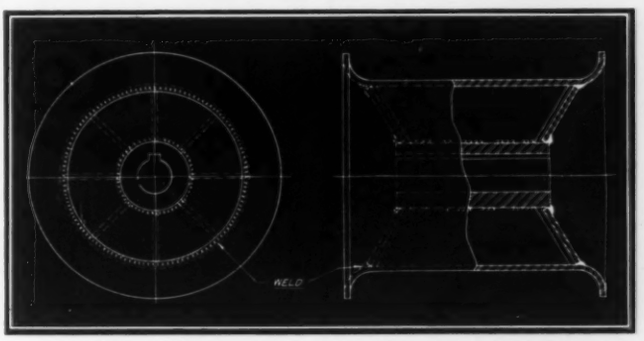


Fig. 2—Details of construction of the niggerhead

Construction of the niggerhead, as shown in Fig. 2, is interesting. It is built completely of ⅜-inch plate, with a steel hub. The drum is made by rolling the plate into cylindrical form and fusing the edges together to form the seam. This cylindrical portion then is joined to the hub by circular sections as shown in the illustrations. Steel plates are used as strengthening ribs between the hub and drum.

Gears of the winch also are fabricated of arc-welded steel. The hubs are formed from bar stock, and the webs from ½-inch plate. Plates for the webs are crimped to form an S, and joined to the hub. The rims of the gears are made from bar stock cut to size, formed into a circle and arc welded to the web.

Employing Monel Metal for Machine Parts

By E. C. Badeau

Fig. 1—Rolled Monel metal stems for gate valves

WITH the advance of metallurgy during recent years and the improvement in metal treating and processing equipment a wide range of new alloys has been made available to the designer and builder of modern machinery. A period frequently and tritely referred to as an "Age of Alloys" has become an era in which the search for materials to meet specific equipment problems is a major factor in industrial progress.

The reason is obvious. Modern requirements demand a combination of properties which few commercially available unalloyed elements offer. Industry must operate under conditions which demand continuous performance without the danger of shut down for replacement or repair. Equipment failures prove increasingly costly as operations become more highly developed.

Nickel and nickel alloys, especially Monel metal, have played an important part in meeting some of these requirements. Monel contains 67 per cent nickel, 28 per cent copper, and 5 per cent silicon, carbon and sulphur. Malleability of the metal is procured through the proper control of these last named elements.

The material finds its place in industrial equipment through a combination of properties. It is impervious to rust, has a high resistance to corrosion and abrasion, and has the strength of mild steel. It also is distinguished by its ability to retain its properties under high temperatures.

TABLE I

Physical Properties

Specific gravity		8.80
Weight per cu. in., lb.		0.318
Melting Point, deg. F. (Ca)		2400
Coefficient of thermal expansion per deg. C.	25° to 100°C	0.000014
	25° to 300°C	0.000015
	25° to 600°C	0.000016
Thermal conductivity, CGS units		0.06
Specific heat, 20° to 400°C		0.127
Electrical resistivity, ohm-mil-ft.		256
Coefficient of electrical resistance per deg. C		0.0019
Modulus of elasticity in tension		25,000,000
Modulus of elasticity in torsion		9,000,000
Endurance limit in alternating stress, lb. per sq. in.		30,000

Tables I, II and III give an idea of its physical and mechanical properties.

There are few industries in which this metal is not used for one purpose or another, because there are few in which strain, corrosion, and high temperatures are not encountered singly and in combination. They are the common problem of the perfume manufacturer, the by-product coke plant, the power plant engineer, the textile dyer, the sugar refiner, etc.

Conventional manufacturing operations can be used on Monel almost as easily as with steel. It can be forged, cast, wrought, machined, welded, brazed, soldered and polished.

In trimming main steam valves with seats and disks or wedge rings, advantage is taken of the material's high metallic density for the purpose of maintaining the original perfection of the

AMONG older-established corrosion resisting alloys Monel metal ranks high. It offers many possibilities for incorporation in the design of machinery, and in the accompanying article E. C. Badeau, International Nickel Co., New York, details some of these uses. The tables included in his contribution will be found to be particularly helpful.

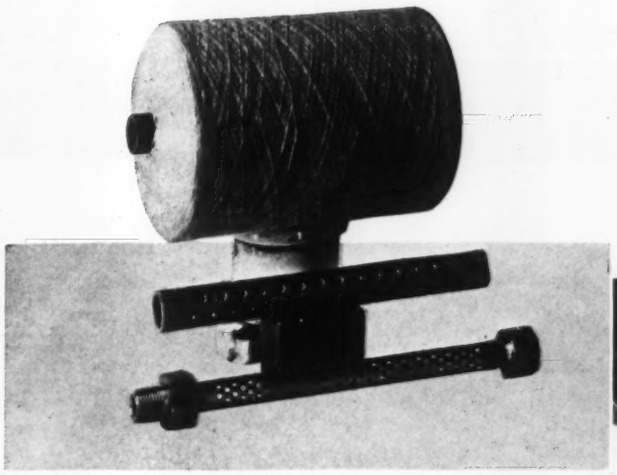


Fig. 2 (Left)—In dyeing yarn, the bobbin is slipped on spindle made from Monel to protect dye from off-color caused by corrosion

MONEL METAL APPLICATIONS

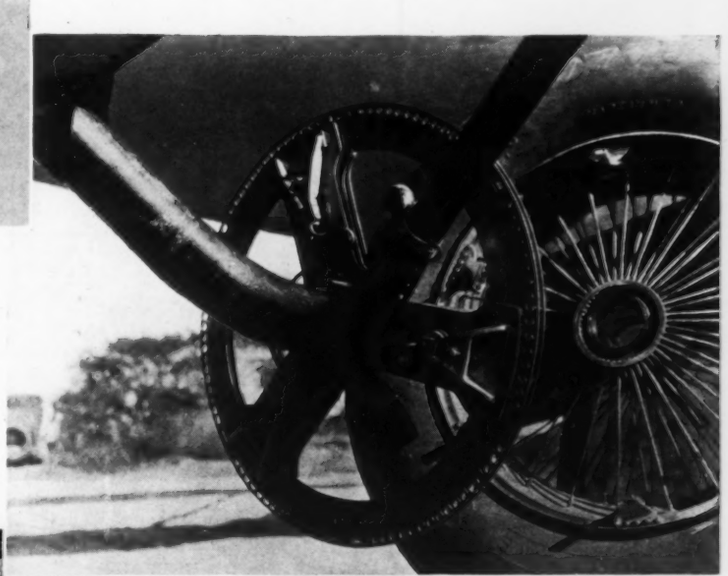


Fig. 3 (Right)—Metal disks used in brakes on Sikorsky amphibian planes

Fig. 4 (Right)—Battery of Klauder-Weldon skein dyeing machines of the nonhoist type lined with anticorrosive metal, as installed in a Philadelphia plant

Fig. 6 (Below)—All blading and shrouding on this spindle for high pressure steam turbine built by the Allis-Chalmers Mfg. Co. are fabricated from Monel

Fig. 5 (Left)—Internal view of a salt drier constructed from plates and strips of the corrosion resisting material

TABLE II

Mechanical Properties of Metal in Various Forms

Forms	Proportional Limit	Yield Point	Tensile Strength	Elongation	Red. of Area	Brinell Hardness
Hot rolled rods	35,000	45,000	85,000	40	60	150
Cold drawn rods	60,000	70,000	100,000	20	50	170
Annealed wire, strip or sheet		30,000	70,000	Dependent on gage		125
Cold-rolled sheet or cold drawn wire	75,000	100,000	130,000	Dependent on gage		200

surfaces. This resists the tendency of high velocity steam to cut away the metal even when carrying abrasive particles of rust from the pipes or crystallized salts from the boiler water. Employment of the metal for valve stems is dictated by its resistance to wear on the control threads as well as its ability to retain a high state of polish for steam-tight integrity where it passes through the packed gland. Any accumulation of rust on the exposed portion of a steel valve stem above the valve would have a tendency to cut the working surface of the packing and also to imbed itself in the remaining surface of the packing. Such grit in the packing subsequently would have a cumulative adverse effect upon the stem.

In addition to the trim of throttle valves the material is used for the blades of turbines built to operate under conditions of high temperature and high velocity. For this type of service, Monel is selected for the combined properties of resistance to erosion, high modulus of elasticity, high fatigue value and tensile strength.

For efficiency under severe service conditions in centrifugal pump construction, Monel is used for impeller and casing rings in addition to its more prominent employment for shafts and shaft sleeves. In the smaller sizes the shaft is made in one piece from bar stock, packing the gland directly on the surface of the shaft. By using a rust proof metal which offers low friction properties in addition to the necessary degree of stiffness, it is possible to use a smaller shaft than otherwise would be possible. This will have less peripheral speed in the packing gland with a consequent lower unit rate of wear. In large pumps of this type, it seems economical to provide a replaceable wearing sleeve over the sections of the shaft which pass through the glands.

The wearing properties of the metal adopt it for use in such sleeves, which generally are made from centrifugal castings. Monel also is used for the shaft because of the practical difficulties of maintaining a water tight joint between the shaft and its sleeve. In pumps in which the casing and impellers are made of bronze, the material is selected frequently for the shaft because of its immunity to any galvanic attack by the bronze.

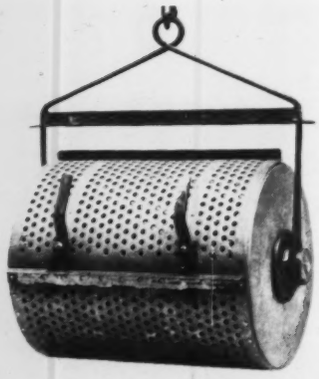


Fig. 7—Pickling baskets and also drums as shown in this illustration usually are made from corrosion resisting alloy to withstand contact with acid

TABLE III

Technological Properties

	Cent.	Fahr.
Strain relief anneal	300	575
Slight oxidation (tinting)	300	575
Approx. limit, continuous operation in oxidizing atmosphere	500	932
Annealing range	700- 870	1300-1600
Hot working range	980-1150	1800-2100
Melting	1350	2460
Pouring (castings)	1540-1565	2800-2850

In steam and water meters of the mechanical type we find the metal used for intermediate train gears, pinions and spindles, as well as bearing bushings. In the differential pressure type of flow meters, orifice plates are made of Monel to retain the perfection of the orifice opening. Corrosion of the aperture would affect seriously the accuracy of the readings. An additional advantage in this type of service is provided by tensile strength under high temperature conditions which permits the outer circumference of the orifice plate to form its own gasket when clamped between flanges in a steam or water pipeline.

Properties which adapt Monel metal to varied uses such as those met with in textile equipment include inertness to most chemicals, impermeability and the quality of being easily and thoroughly cleaned. Fabrics may be scoured, bleached, and dyed in the same machine; or in dyeing, shades may be changed frequently with little loss of time and with no danger of color spots or stains. For the same reason cloths of any construction from heavy cotton drills to the most fragile of silk or rayon crepes may be processed without danger. One other essential property adapting Monel metal for use in such equipment is that it is worked easily; that is, it may be rolled or cut into any desired size or form and may be welded or silver-soldered with smooth, leak-proof joints giving practically the same strength as the metal itself.

Significant Factors in Choosing a Lubrication System

By L. A. Ballard

MORE and more is it becoming recognized that lubrication is one of the important considerations in modern design of machinery. For this reason MACHINE DESIGN plans to publish from time to time articles reviewing the various up-to-date systems employed. The author of the accompanying article is associated with the Alemite Corp. Chicago.

HOW often have designing engineers gazed with pride at the first production of the "new machine whose efficiency will be a revelation in its particular field of duty," only to worry later about some oversight brought to light through actual service? And how frequently is this oversight a problem of lubrication?

Many times an original, hand made machine which is the production model, is operated in an experimental shop where its builders may watch carefully over it. Many times those engineers will grab an oil can and squirt oil on this or that particular moving part.

"Lubrication—that's easy, for if the design of the machine accomplishes the original objective it's no problem to lubricate it properly."

Such is the manner of considering lubrication in many an experimental department today. But isn't it more logical to weigh the problems of "how that machine will be lubricated by any concern which might buy it," and "how its lubrication will affect its operation and length of service?"

There are several interesting factors which should govern the choice not only of the method of applying lubricant, but of the type of lubricant itself.

Shall Oil or Grease Be Used?

Technically speaking, mineral oils contain the highest lubricating qualities of any commercial type of lubricant. But when we revert to the practical considerations mentioned previously, we find that the application of oil offers a difficult problem. Oil, being volatile, seeks its own level, follows the lines of least resistance, and tends to drip out of bearings. It is only one-fifth as lasting as a semisolid or plastic lubricant, in about 75 per cent of its applications, simply because it is wasted.

High Grade Lubricants Recommended

On the other hand all greases are not suitable for industrial lubrication. Antifriction bearing manufacturers recommend a semisolid lubricant, or a solidified oil of light consistency, containing only high grade ingredients. Cheap greases, so often compounded by acid processes, from unsuitable vegetable fats and oils, serve only to clog bearings. The oils separate under pressure leaving a pulp like substance which has no lubricating value. And a trace of sulphuric acid will do more harm to a polished bearing surface than no lubrication at all. Better grade

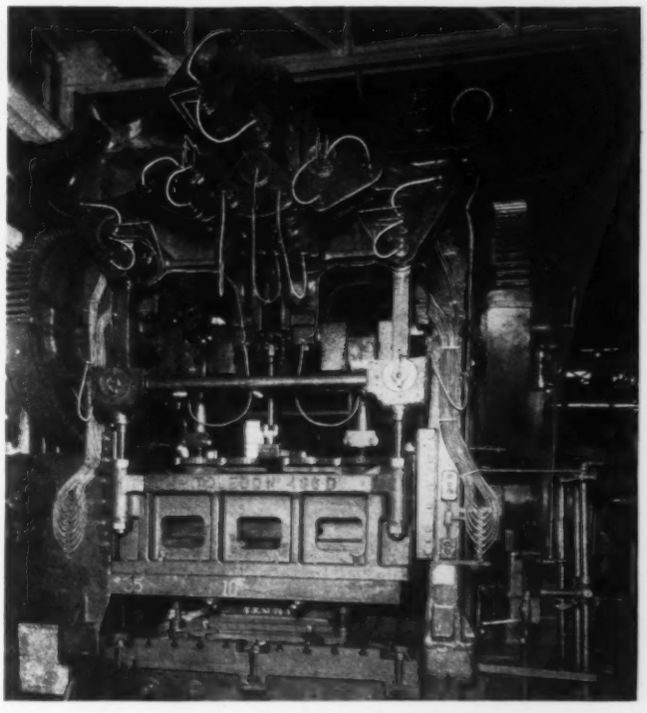


Fig. 1—Each bearing on this giant press is lubricated individually without production loss

lubricants are steam cooked, and are made only of high grade mineral oils and prime animal fats. In practice, such high quality lubricants are far more efficient than either oils or cheap cup greases.

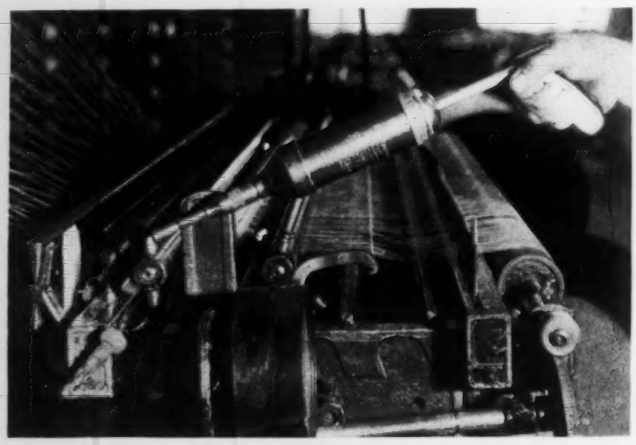


Fig. 2—Dripping oil would spoil much of the thread passing through this machine

In choosing a system for the application of solidified oil lubricants, there are several factors to be considered—and several steps of foresight that, if followed, will result in much less operating trouble on almost any type of machine.

1. One of the most important considerations is whether the system lubricates positively. It is possible to spend great sums of money on lubricants and lubricating labor, without receiving proper results, simply because of the methods in use. For example, an oiler in an industrial plant may spend an hour a day filling and turning down the old type grease cups on a conveyor or a machine. The maximum pressure he can develop by twisting down an average grease cup is about 30 pounds per square inch. This pressure is wholly insufficient to force lubricant throughout the bearing, opening clogged surfaces and cleaning it of grit or dirt that might have entered.

Supply Assured by Pressure

A system employing at least 2,000 pounds pressure has been found necessary for the lubrication of the average machine bearing. Such pressure behind lubricant is sufficient to force a fresh supply to the furthermost surfaces, cleaning it as it is lubricated. When equipped individually with fittings for lubrication, each bearing may receive a definite quantity of clean lubricant, without worry as to whether or not it will drip out.

2. A lubrication system should be simple enough that, regardless of where the machine is installed, its lubrication will be done properly, and without neglect. If possible, it is desirable to eliminate the laxity of the human element by making it easy for any man, regardless of his responsibility, to lubricate the machine.

The high pressure method of lubrication requires little or no brains to operate. Fittings are within easy reach of the lubricating compressor and if operated at all, the compressor will develop a ton of pressure. When lubrication is easy, it is not neglected.

3. If bearings are inaccessible, bring their lubrication out into the open. "Out of the way" lubrication points are too easily overlooked.

With high pressure lubrication, and the use of header blocks, the lubrication of inaccessible bearings becomes simple. As many as thirty or forty points of lubrication may easily be reached by a man who needs only to force lubricant through the fittings and conduit pipes with his compressor.

4. A lubrication system should be rapid. In many plants, where lubrication is not considered a maintenance operation, and each machine operator is responsible for his own machine, it should be necessary for him to spend only a few minutes a day to keep it in running condition.

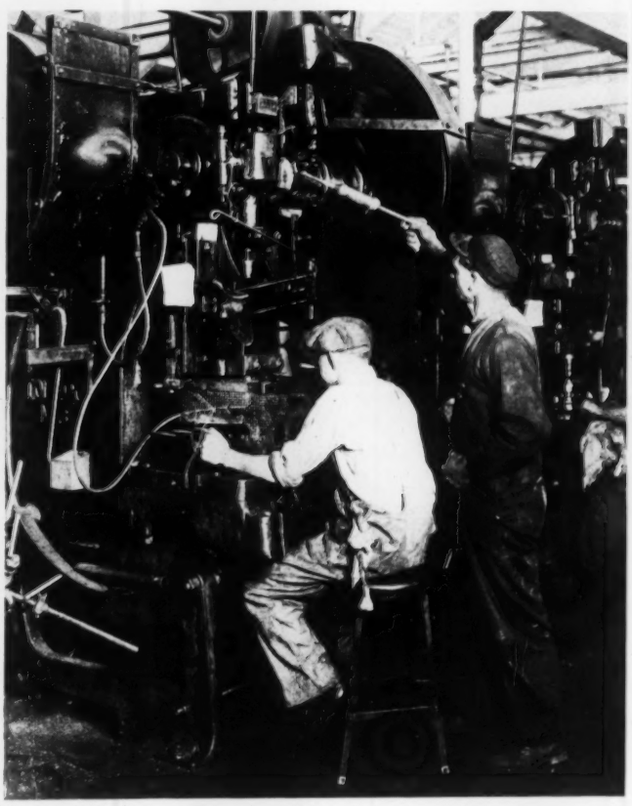


Fig. 3—Lubricating machine during operation

If bearings are equipped for high pressure lubrication, it is an easy matter for him to keep his machine in tip-top condition without spending an unnecessary amount of unproductive time in lubricating it.

5. Most industrial plants today in which a

(*Concluded on Page* 55)

Standardization of Motors

By J. L. Brown

BECAUSE of increased application of individual electric motors for machine operation, standardization in this field has become an important subject. Its need is recognized and discussed in the accompanying abstract of a paper presented by J. L. Brown, Westinghouse Electric & Mfg. Co., at the recent meeting of the American Society of Mechanical Engineers at Chicago. Numerous aspects of motor standardization are considered, and many of the points brought out will be found applicable to general design of machines.

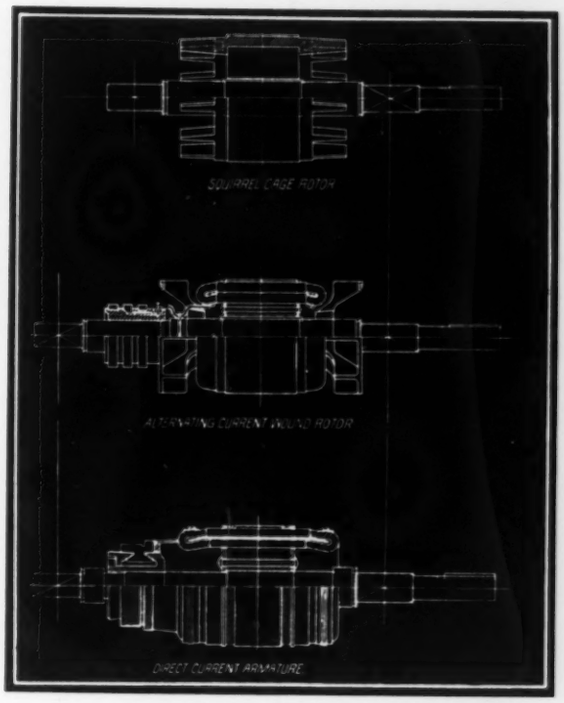


Fig. 1—Construction of rotating elements for three types of motors

THERE has been a growing need for greater uniformity in physical dimensions of motors which otherwise are sufficiently similar to do the same job, irrespective of the manufacturing plant in which they originate. Not only so, but the rapidity with which uses for electric motors are multiplying calls for the lowest cost of manufacture of not only what might be regarded as the standard type, but the many variations from this standard that are necessary to meet the various conditions of service. This dictates every possible measure of uniformity among the various standard and semi-standard accessory parts comprising the variations of any given motor unit.

Standardization of simple parts such as bolts and nuts though attended with many difficulties, is by no means the complex problem encountered in the standardization of motor dimensions. In addition to the necessity of effecting an agreement among motor manufacturers, it also is necessary to effect a compromise among types of motors, which in many of their detail parts are essentially dissimilar. It is interesting and profitable to consider briefly the development of one of the newer lines of motors which demonstrates to what extent standardization as among dissimilar detail motor parts may be effected, thus resulting in great flexibility in machining and assembly methods when producing units which, although similar in external dimensions are essentially different types.

Not all applications for electric motors are served most satisfactorily by a constant-speed, polyphase, alternating current motor, and in meeting the requirements of certain applications, types of motors must be used in which the simplicity of the squirrel-cage induction type is lost to some extent. Variable speed induction motors, for example, require the insertion of resistance into the rotor winding circuit necessitating that these windings be insulated from each other and the core, and connected together in such a way that terminals may be brought out and connected to the necessary resistance through collector rings and brushes. The addition of the collector rings makes the rotor unsymmetrical about the center line.

Rotors Have Similar Mechanical Features

For a number of purposes the characteristics of direct current motors outweigh in importance the simplicity and low cost of the induction motor. In this type the rotor windings are arranged much as are those of the variable speed induction type, but are attached to a commuta-

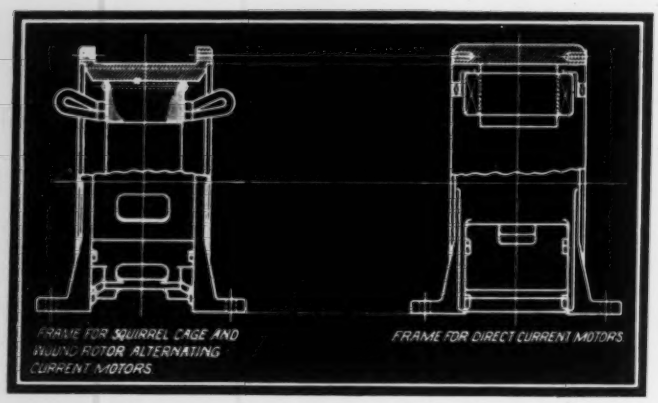


Fig. 2—Comparison of alternating and direct current motor frame structures

tor instead of collector rings. Fig. 1 gives a comparison of the three types of rotors. It should be noted that in spite of their dissimilar electrical features, the three are similar in diameter and length from the center line toward the right, that the two last are similar to each other from the center line toward the left, and that, that part of the first from the center line toward the left is similar to that part of all three from the center line toward the right.

Turning to a consideration of the stationary structures, Fig. 2 shows that whereas a frame or stator portion of exactly similar description is suitable for both constant and variable speed induction motors, the direct current motor-frame assembly is dissimilar. The magnetic

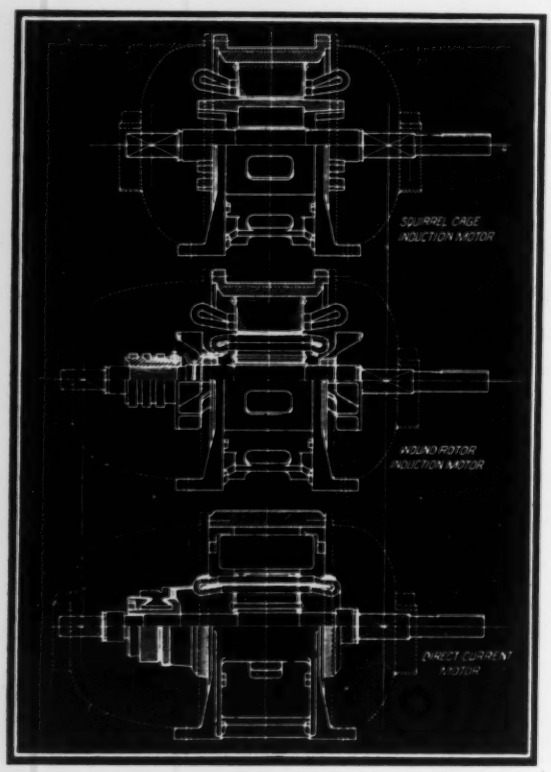


Fig. 3—Rotor and stator assemblies of different types of electric motors

circuit in the stationary part of induction motors is confined to a stack of sheet steel laminae carried in a frame structure which furnishes physical strength and means of attachment to the driven apparatus or foundation. The laminated core structure usually is much smaller in diameter than the maximum diameter of the supporting frame, due to the necessity of providing passages for ventilating air. On the other hand, the direct current motor requires no lamination of the material forming the stationary part of its magnetic circuit due to the fact that in this part the magnetic lines of force are unidirectional rather than alternating, but the diameter of the part carrying the magnetic flux must relatively be larger than in the case of the induction motor due to the salient pole construction required for most efficient design.

Bracket May Be Designed for Interchanging

The problem with which this discussion is concerned is that of suiting these essentially different sets of active elements with accessory mechanical parts necessary to form a motor unit which can be applied to a job. Fig. 3 shows the stationary and rotating parts of the three types being considered in assembled relation. At the right the journal portions of the three shafts are in identically the same position from the center line of the machines. Also, the machined ends of both types of frames are identical in position and mounting detail. To support the rotating members from the several frames at this end, it is possible to design an interchangeable bracket structure fitting, and bolted to the frame ends and supporting at its outer end a bearing adapted to fit the journal portion of the shafts.

In a similar way a bracket structure may be designed for the opposite end to serve both the wound rotor induction motor and the direct current motor except that allowance must be made for the different types of brush rigging required for collector and commutator respectively. The squirrel-cage induction motor being symmetrical about the center line will use the same bracket structure at both ends. Thus, for all motors of a given size, only two distinct bearing brackets are required to serve every electrical type, resulting in maximum activity and minimum cost for this important accessory part.

Of recent years ball and roller bearings have gained favor in some quarters for motor application. The great variety of types and makes of these bearings, each with its following of proponents among users, has introduced many problems in their application to motors, and has tended toward diversity of mountings involving unnecessary expense, and delay in delivery of the apparatus to the user. In the design of the line of motors under discussion, the problem of standardization of ball and roller bearing housings has been given careful attention.

Ball bearings are made in single and double

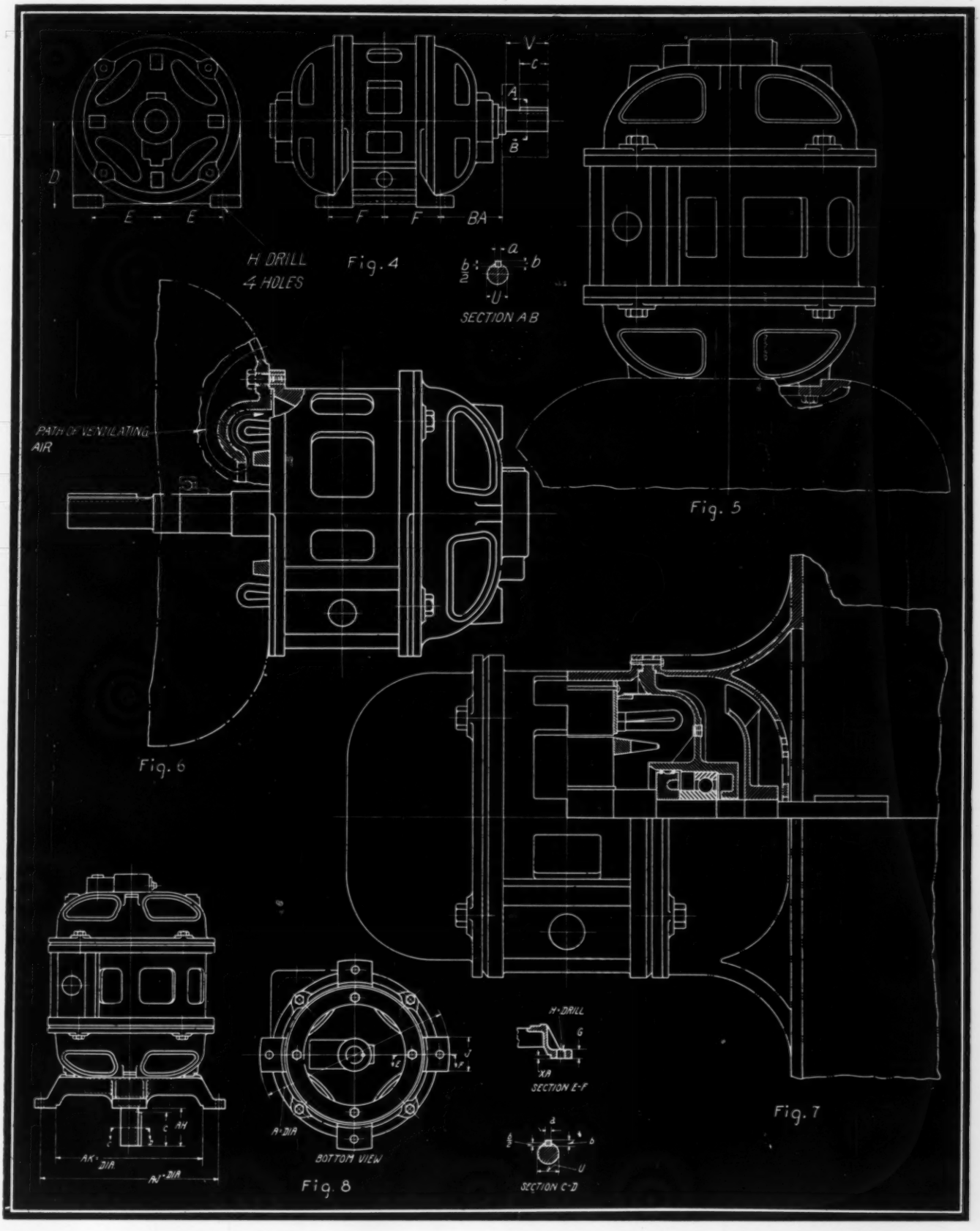


Fig. 4—Mounting dimensions for horizontal motors. Fig. 5—Intimate end mounting for horizontal or vertical motors. Fig. 6—End mounting of electric motor where driven machine provides rear bearing and air guides. Fig. 7—End mounting of enclosed ventilated motor where driven machine forms rear blower casing. Fig. 8—Mounting dimensions for vertical motors

width by almost all manufacturers. One manufacturer has an intermediate standard. Roller bearings are made to all three standards by various manufacturers, and some differ only a small amount from the standard. Others are made in inch dimensions, whereas most ball and roller bearings have their outside diameters and bores in millimeters. This great diversity in dimensions is one of the factors in making an interchangeable mounting difficult of achievement. A number of bearings of dissimilar width are illustrated in the left-hand column of Fig. 9. The right hand column shows the various makes of bearings reduced to interchangeability. In this arrangement, the width of the double row ball bearing is adopted as standard. Single row bearings are provided with an inner race extended at one side to give a total width equal to that of the double row bearing. All makes of bearing can be obtained in the double row width, thus making it relatively easy to serve customers with their preferred brand.

The greatest bearing load occurs at the shaft-extension end of the motor, the load at the opposite end being relatively light. To suit this disparity in loading, it has been customary to use a large bearing at the shaft extension end and a small one at the opposite end. This, however, results in two different end brackets for a squirrel-cage induction motor which otherwise is symmetrical. In the new design, this difficulty is overcome and at the same time the bearing capacity suited to the load by employing a large capacity double row bearing at the pinion end, and a relatively lower capacity interchangeable single row bearing with wide inner race where the load is relatively light.

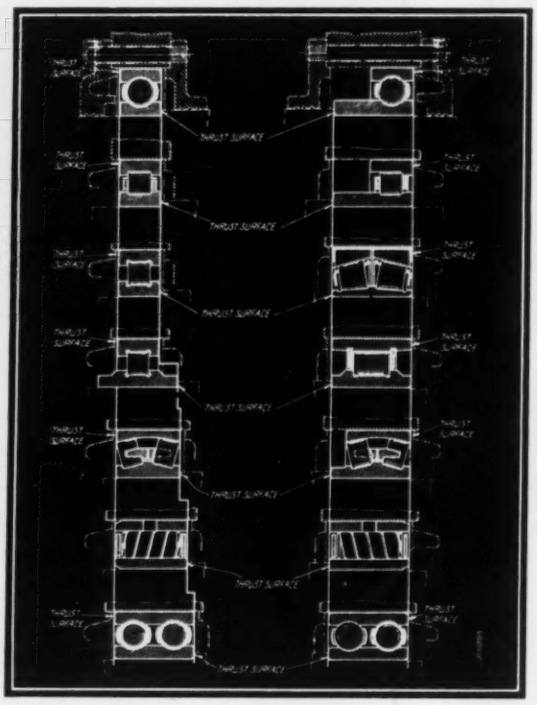


Fig. 9.—Noninterchangeable and interchangeable ball and roller bearings of various makes

Motor Attachment Needs Consideration

Important as is the internal design of electric motors, it is no less important that the attachment of the motor to the foundation or driven machine receive careful consideration. Interchangeability from this standpoint has suffered a measure of neglect in the past, and is a feature that recently has been the subject of much profitable discussion.

The important dimensions affecting interchangeability of standard horizontal motors are the shaft and keyway dimensions, the distance from the face line of the pinion or pulley to the first pair of holding down bolts, the distance between the first and second pairs of holding down bolts, the distance between these bolts at right angles to the shaft, the size of the bolts and the height of the shaft center line above the bottom of the motor feet, all as in Fig. 4.

Mounting Dimensions Are Shown

Oil-lubricated motors, generally speaking, may be tilted so that the shaft makes an angle of 10 or 15 degrees with the horizontal. For greater inclination up to the vertical position, grease lubricated motors are the common solution. Fig. 8 shows the important mounting dimensions for vertical motors.

It often happens that it is desirable to mount motors either horizontally or vertically in more intimate association with the driven machine than is possible by using the more widely used standard mountings. Fig. 5 shows how the driven machine may be substituted for the vertical bases so that bosses on the end brackets are employed directly as the means of attachment. It readily will be seen that this provision incorporated in the brackets introduces no interference with machining operations arranged for brackets where this is not required. Indeed, the presence of these bosses in standard foot-mounted horizontal motors is in no wise detrimental, and may be useful in mounting brakes, gear guards, etc.

Fig. 7 shows an intimate mounting of an enclosed ventilated motor in which a portion of the driven machine becomes the substitute for the fan or blower casing. The motor, in this case, is supported through the bracket to the frame ring and a neat and compact arrangement is obtained. In the case of open motors, the driven machine sometimes is formed to take the place of the end bracket, winding clearances and air guides being provided as required. In such cases a so-called "three-quarters" motor is provided as illustrated in Fig. 6.

In some instances it is expedient where the shaft of the driven machine is relatively large and rigid, to overhang the motor rotor on an extension of such a shaft without an outboard bearing.

Metal Show Reflects Progress

Industrial Development Characterized by Technical Papers Containing Many Features Related to Design

PROBLEMS and interests of the designing engineer, metallurgist, and other technicians in industry are intimately related as shown by the fact that the recent Twelfth National Metal congress at Chicago drew the attendance of a large representation from all engineering groups. Numerous aspects of industrial activity were treated in technical papers presented at the meetings of the American Society for Steel Treating, Institute of Metals and Iron and Steel divisions of the American Institute of Mining and Metallurgical Engineers, American Welding society, and the Iron and Steel and Machine Shop Practice divisions of the American Society of Mechanical Engineers, the co-operating organizations.

At the metal exposition at Stevens hotel corrosion-resisting, stainless and high speed steels in various mill shapes, and fabricated in miscellaneous commodities, featured many of the displays. In addition there was an interesting portrayal of machinery showing progress made in design to meet the new requirements of operation. Over 175 companies were represented at the exhibits.

Technical sessions continued throughout the week, each organization presenting its respective program. Noteworthy papers included the discussion of "Corrosion and Heat Resistant Nickel-Copper-Chromium Cast Irons," by J. S. Vanick and P. D. Merica, International Nickel Co., New York, given at the initial steel treaters meeting. The papers brought out that this material, except for being considerably more corrosion and heat-resistant than plain iron, is in general quite similar to it in characteristics and in fabricability. It may be cast readily, machined and welded, although modifications of cast iron practice are in some cases necessary.

Fatigue Tests Are Discussed

Another interesting paper at this meeting was given by R. E. Peterson, research laboratories, Westinghouse Electric & Mfg. Co. It covered the subject, "Fatigue Tests of Small Specimens with Particular Reference to Size Effects." In comparing fatigue tests on a small machine to similar tests on larger machines the paper set forth that for ordinary steels no appreciable size effect occurs up to 2-inch diameter. For cast iron the results obtained with small specimens are erratic.

Presents Topic of Popular Interest

"Phenol Resinoid Molding Technique," by Leon V. Quigley, Technical Editor, Bakelite Co., New York, opened the technical sessions sponsored by the machine shop practice division of the American Society of Mechanical Engineers. While the paper did not advocate a sweeping substitution of the synthetic resin compounds for metals, stone and wood, Mr. Quigley pointed out that with their refinement they are finding useful and economical applications in practically all fields including machine design.

Among the papers presented at the meetings of the American Welding society were three of timely interest, namely, "Welding of Stainless Steel," by L. S. Hostettler, Allegheny Steel Co., Brackenridge, Pa.; "The Electric Arc Welding of Aluminum," by W. M. Dunlap, Aluminum Co. of America, New Kensington, Pa., and "Oxyacetylene Welding of Corrosion Resisting Steel," by W. B. Miller, Union Carbide & Carbon Research Laboratories, Long Island City, N. Y. The author of the first paper declared that some corrosion and heat resisting steels lend themselves more readily to welding than others. In most cases special technique and precautions have to be employed. Discussing arc welding of aluminum Mr. Dunlap asserted that rather extensive investigations have been in progress at the research laboratories of his company. As a result of this work the process has been developed to the point where within certain limits it may be considered practical as a production method. At the present time the successful commercial arc welding of aluminum and its alloys is being done by several metal fabricating plants.

"Modulus of Elasticity of Aluminum Alloys," was the subject of the paper prepared by R. L. Templin and D. A. Paul, Aluminum Co. of America, and presented before the members of the Institute of Metals, division of the American Institute of Mining and Metallurgical Engineers.

Analyzing Types of Bearings Used in Machines

By J. A. Hoff

DESIGN of the antifriction bearing is an inherited problem, undertaken as far back as we have been able to visualize the dawn of the machine era as reflected in the implements used by primitive engineers to move themselves and their needs about on the face of the earth. With the glacier as prototype to the sledge, the sledge to the wheel, etc., we have a long and slow progress of improvements, all having in principle a common objective in the elimination of friction between two sliding contacts, and culminating in the preloaded ball bearing with a roll contact.

It is the purpose of this article to prove by a fair analysis of the best forms of bearings in general use, all from the angle of design rather than from the angle of the manufacturer or the optimistic user who has just installed a late improvement, that the 100 per cent bearing has not been designed. Furthermore, that we are more likely to pass the problem on to our heirs if we continue to build bearings to the load rather than reverse the procedure of the past and seek a prototype above the glacier.

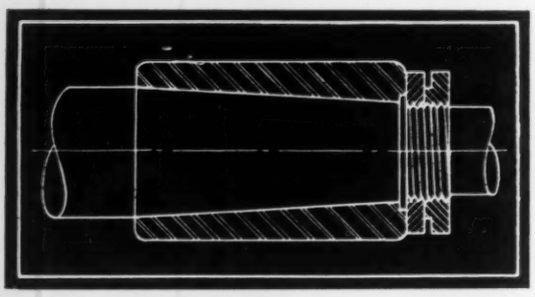


Fig. 1—Sleeve type plain bearing, given good lubrication, has low coefficient of friction

The three forms of high-speed bearings now available to the designer of a mechanical movement whose function it is to transmit power at high speed from some form of prime mover to some other form of useful product with a low transmission loss are: Fig. 1.—The hardened and ground sleeve type. Fig. 2.—The cup and cone type of roller bearing. Fig. 3.—The precision ball bearing. All are procurable as standard equipment and are manually adjustable for wear and load. These three were selected for comparison purposes because they satisfy more nearly the present demand for high speed and accuracy.

To simplify our analysis, as above outlined, we must assume for Figs. 1 to 3 several factors of prime importance: first, that all contact surfaces are lubricated; second, that materials used are inelastic and not subject to flexure at normal loads; third, that surfaces in contact all are ground to perfect circles at points of contact.

Referring to Fig. 1: All things being equal, the tapered sleeve bearing almost meets the specification of our ideal bearing, having the lowest friction coefficient of them all in the laboratory, or so long as the viscous film remains intact between the two surfaces, for then there is no measurable friction.

Tolerance May Be Small

The grinding limit in this type may be as close as minus .0001-inch and while so operating there can be present but one of two conditions—it either is unctious or abrasive. So long as the microscopic film holds it is unctious or frictionless. If the film is severed, as by the film creeping to the apex of the cone under centrifugal stress at high speed, it is abrasive, and the metal to metal contact at speed produces a scoration deforming the contact area, so that we have either an inscribed or a circumscribed polygon (as either member is the softer), so that no amount of optimism or expert adjustment can restore the bearing to its original accuracy.

In Fig. 2 we find a larger percentage of points toward the ideal in practice. The efficiency of this bearing under most severe conditions of load and shock is phenomenal. The line contact of conical rollers provides less load carrying capacity per unit volume than Fig. 1, but approximately five times that of Fig. 3 per unit volume. On laboratory test it has a factor of .004 to .006 against .0015 to .002 for a good ball bearing under equal test conditions, due to a problem of design of too great scope to be handled in this article. Briefly and simply

stated, the cup and cone of bearing are generated from a point on axial centerline of bearing, while radial load is applied tangentially. There is therefore a differential to be taken up in an unctious metal to metal contact, where cup is stationary in housing, while cones revolve in circular path and on their own axis.

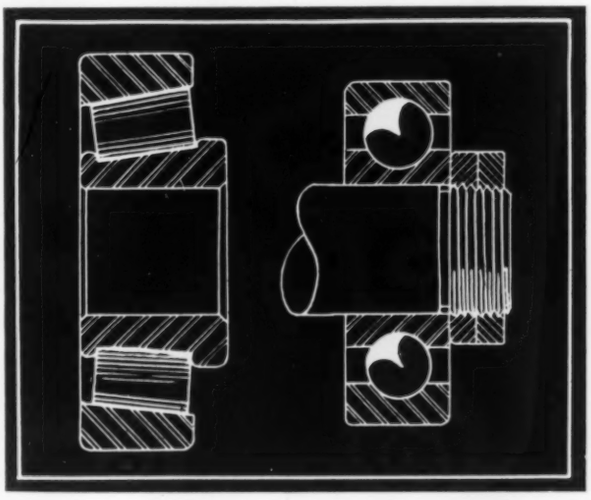
Each roller having two line contacts (one on cup and one on cone) it follows that any axial adjustment of cup or cone, from a fixed relationship to each other in the assembly as a whole, must result in a line or shoulder contact on each end, providing there has been metal removed by appreciable wear.

Little Attention Is Needed

The bearing in Fig. 3 has the largest percentage of points toward the ideal. Where extreme loads and shock are not involved, the deep groove or Conrad type of bearing will give the most satisfactory service under severe working conditions. Where the safe load per unit of ball diameter is not exceeded, bearing will operate with minimum lubrication and maximum of service. Being adjustable, bearing wears in rather than out. Original design calls for grinding clearance of 2 per cent on inside raceway and 3 per cent on outside, to give ball a freedom to wear in its own perfect raceway, having a freedom to spin on its own axis just enough to insure spherical wear and doing by a wearing-in process that which no mechanical equipment now available could do in the laboratory or in production.

Failures due to design have been few, following faulty adjustment and lack of lubrication as major causes of bearing failures. The rarest of all is the bearing actually worn out in service and the writer of this article has not seen one out of many thousands of bearings rejected for various causes.

Fig. 4 is a preloaded high-speed grinding quill



Figs. 2—(Left)—and 3—(Right)—Types of roller and ball antifriction bearings

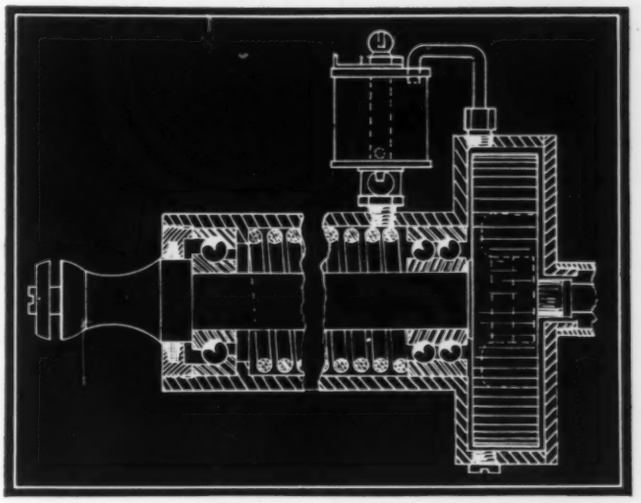


Fig. 4—High-speed grinding quill embodying unique method of lubrication

equipped with a double row bearing on driven end of spindle, and a single row radial thrust type of same make on working end. As shown, the single row angular contact bearing is mounted in fixed position in housing. Double row deep groove bearing is mounted floating in housing, inner ring being locked to shaft and balance wheel, the whole being designed for flexible drive. Preloading is not adjustable and bearings are under tension of heavy coil spring, providing in this case a permanent load of 20 per cent of the safe load of the radial thrust bearing in axial plane, to stabilize spindle as balls wear in to a perfect raceway. All parts of this model spindle being ground to zero tolerance the overall eccentricity in operation is negligible and beyond the range of instruments available to the writer.

Attention is directed to simplicity of the lubrication system. During normal running oil cup holds reserve of oil, with feed set by thumbscrew, all surplus of oil being driven out of housing by centrifugal action of balance wheel, and returned to the feed cup.

Combines Lightness with Strength

A new metal alloy which combines the lightness of aluminum with the hardness of steel recently was developed by Johan Haerden, a Stockholm, Sweden, engineer. According to the news dispatch from Stockholm, the material can be rolled and forged and is impervious to all corroding acids. In Swedish engineering and aviation circles it is believed that the alloy will greatly benefit airplane manufacturers, particularly in hydroplanes, because of the resistance of the new metal to salt water. The present demand for light weight alloys has created unprecedented interest in new discoveries in this field.

PROFESSIONAL VIEWPOINTS

Publication of letters does not necessarily imply that MACHINE DESIGN *supports the views expressed*

Comments from Our Readers. Machine Design Will Pay for Letters Suitable for Publication

Preserving Valuable Drawings

To the Editor:

THE very able and timely article by E. L. Chevraux on this subject in September MACHINE DESIGN prompts me to offer a few observations along similar lines. It has been my experience that girls rather than boys are best suited to handle the actual filing and recording work involved in the systematic care and utilization of tracings. I believe girls are more careful, systematic and reliable, and if well chosen, are liable to remain more permanently on this job. Even supervision of this work can best be entrusted to a woman, as its success depends on a faithful observation of many detail rules and procedures.

Though there may be many points in favor of the edging machine referred to in Mr. Chevraux's article, care taken in the preservation of the tracing should begin right at the drafting board. A folded strip of paper tacked along the edge nearest the draftsman eliminates the first curling tendencies which otherwise might be started by the constant contact of the draftsman's person as he works on the board. A plain margin of some four to six inches outside the border on the right side of the tracing where the drawing number is placed, gives a free edge to take the wear and tear of feeding into the blueprint machine and also serves to protect the drawing proper.

Only the correction of obvious errors should be initiated on the tracing without advance approval, all other proposed changes being written up briefly on an engineer's form, and approved by all authorizing personnel before the actual tracing is changed. This same authorizing form also may act as advance notice and authority to the shop. In this way tracings are not subjected to erasure wear when a change is not approved.

Actual handling of tracings can be minimized. All checking should be done on blueprints. Tracings never should be removed for references. All issued tracings that have been removed from the files for any reason should be returnable at the end of each week. Even if they are in process of change, they can be borrowed again on Monday morning. This prevents tracings laying around awaiting revised instructions or decisions. The best quality tracing cloth is good economy. Pencil tracing cloth drawings can be greatly improved in wear resistance by a spray coating of lacquer which easily is applied before blueprinting.

—JOHN F. HARDECKER,
Philadelphia

Practical Aspect of Design

To the Editor:

THE idea that practical contacts are essentials of sound design cannot be overestimated. An engineer responsible for design who can appreciate the point of view of the shop man, who can design to the best practical advantage and can choose the proper machine and processes where alternatives are possible, is treble the value to the company that the mere copyist, bound slavishly to precedent, ever can hope to be.

Where a man finds himself deficient in practical knowledge in any particular which is affecting his usefulness, the defect can be remedied with application and observation. He should take careful note as he passes through the various shops, of the machine tools and processes being used. Keenness of perception is not wholly a matter of temperament, it can be cultivated to an astonishing extent. With practice, what the eye learns to see, the brain learns to store and the mind learns to interpret.

When a shop alteration to aid practicability and to ultilize machining and other provisions to better advantage is made to a designer's drawing, he should seek to know the *why* as well as the *how* of the matter. For a little trouble taken then to understand the reason for the change can go far to acquaint him with information of the utmost value to him, and

through him, to his employers. In other words, it is good policy when designers are encouraged to get into effective touch with the shops.

D. KAUFMAN,
Philadelphia

Modern Function of the Designer

To the Editor:

WHILE manual skill which properly is draftsmanship gradually has assumed a less pretentious and less important place in our industrial life, machine designing has become a far more important and far more complex occupation than ever before, and the demand for design ability is increasing almost daily. A decade or two ago the designer's mental equipment consisted of a fair working knowledge of mathematics, mechanics, strength of materials, and mechanism, together with a smattering of practical information which was best gained in the shops, and such specialized knowledge as might be necessary in the designer's field.

But today's situation is different. The designer has, first of all, a much more involved industrial situation to deal with than ever before, with a multitude of manufacturing processes, many of which are being improved on almost constantly. He has a much larger field of materials with which he must be familiar, and the field is growing rapidly. Finally, he is expected to bear in mind all the economic factors effecting and effected by his particular problem, for the mere ability to get the wheels to go around, to produce a certain mechanical result, no longer is the only consideration. The result now sought is economical, the mechanical means being incidental and subservient.

During the course of an interview a high official of an engineering company asked an applicant for a situation in the design department, "Mr. Jones, if you come to work with us, are you willing that your value be measured altogether on a dollars-and-cents basis? Are you willing that any savings that may be effected by the machines and processes that you may devise, are balanced against all the costs chargeable against your machines?"

The question is one of common sense, and it seems such a simple one that it scarcely should be worth dwelling on. Yet the economic end of machine design all too often is lost from sight. Trade school and college course, textbooks and handbooks, emphasize the purely mechanical aspect of design, and the student or draftsman who aims to fit himself for the most worth-while design positions has to go far from the beaten engineering path to get the economic background he needs. Yet this dollars-and-cents background, coupled with a thorough understanding of engineering principles, is of the utmost importance not merely as a means for greater usefulness and greater success for the individual, but also, and indeed primarily, as one of the foremost factors in furthering our civilization. All the remarkable discoveries and inventions of recent years—the incandescent lamp, the telephone, the radio—would be but so many curiosities fit to display at fairs and exhibits if it were not for the economies made possible by properly designed machines. And today, even with production methods, these same articles would be far too costly for the average man to enjoy if it were not for the continuous and successful efforts to cheapen manufacturing processes partly by redesigning the product itself and partly by the construction of more economical machines—machines that will not merely perform definite manufacturing functions more cheaply than ever before.

In standard machine tools the economic question becomes, insofar as the designer is concerned, chiefly one of durability and mechanical efficiency. The real burden of economic analysis here falls on the buyer, and although a tool may be the finest of its kind the purchasing transaction often is a case of *caveat emptor*, for the finest tool on the market is not necessarily the correct tool for the duty it is to perform. In the design of special machines, however, it is not a question of "let the buyer beware," but rather of "let the designer consider all economic as well as mechanical factors."

—JOHN FLODIN,
Minneapolis

To Standardize Analyzing Methods

STANDARDIZATION of methods for analyzing aluminum alloys is seen as the result of recent action taken by the Aluminum Research institute. Variation of analyses made by commercial laboratory and the smelter led to investigation and subsequently to an effort to bring about standard procedure by the organization.

The initial meeting of the chief chemists of the members of the institute was held June 30 to confer with the chief chemist of a highly regarded and internationally known commercial laboratory. Plans were laid and standard practices that are currently used by the commercial laboratory and by members of the institute have been exchanged and are being studied critically. When the problem of standardizing the method of analysis of secondary aluminum and its alloys has been solved the confusion that attended previous composition reports will have been eliminated and an important task accomplished.

Progress Made in Design Is Epitomized

NO MAN could be criticized, from the aspect of veracity, for the statement that design is one of the most important functions of civilization. Since days of early history, when crude tools were "fashioned," design played its part. Without design man could not have progressed to the point of utilization of forces of nature such as the harnessing of water and the employment of air currents for the creation of power.

Up through the ages design and civilization have moved forward —sometimes slowly, sometimes rapidly—until the dawn of the so-called "Machine Age" which followed the invention of the steam engine by James Watt about 1765. Since that time striking progress has been made, this being based largely on the development of machine tools and resultant design of all classes of machinery, component parts of which are fabricated on these tools.

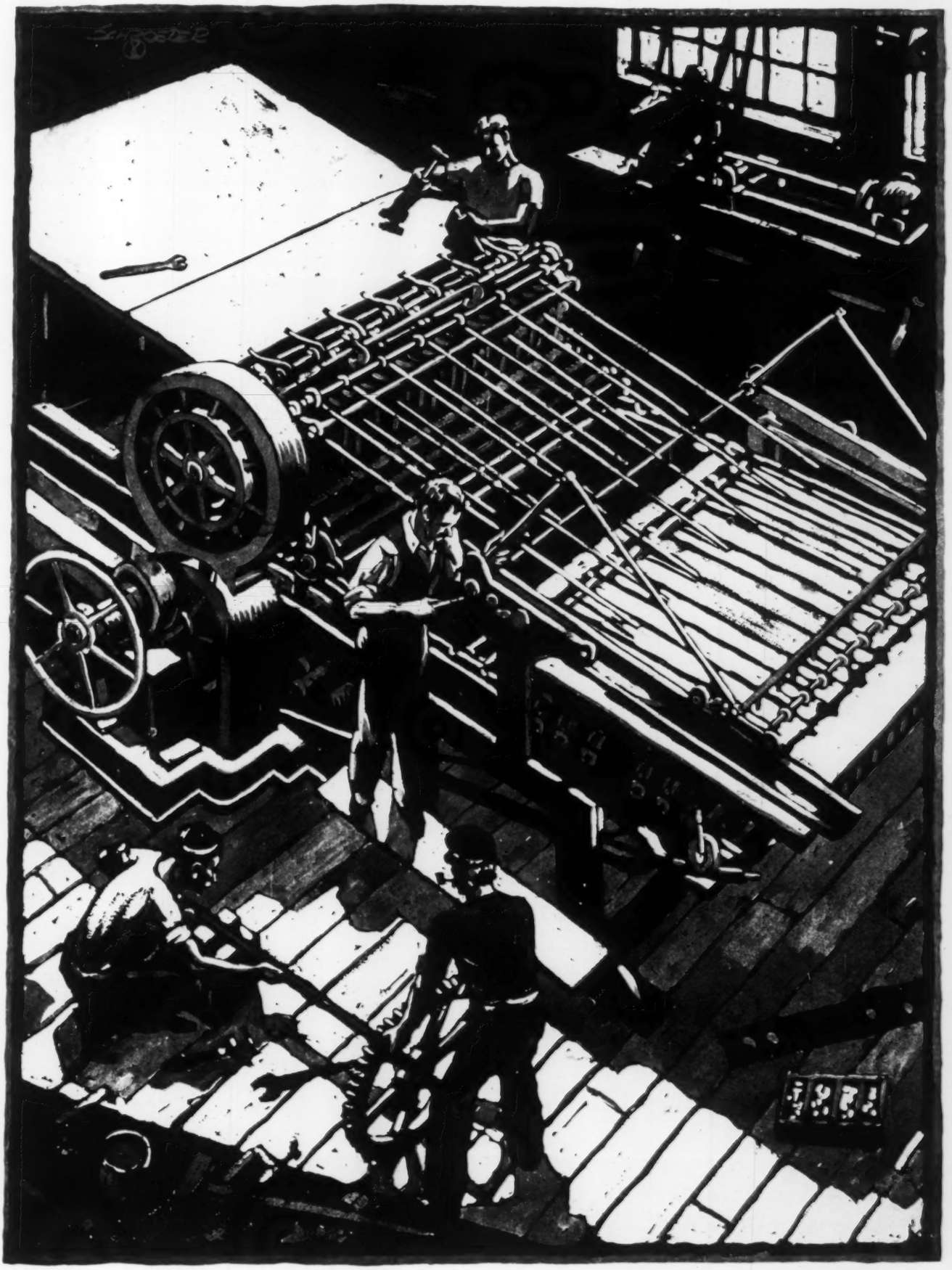
In recognition of the art of design and to epitomize particularly this latter phase of progress, a comprehensive exhibit is being presented by the Museums of Peaceful Arts, New York, featuring in the form of models, machines and graphic devices, the various types of metals, machinery, machine parts and processes dating from early times to the present day. Engineers responsible for design cannot fail to be inspired by this visible sign of the march of civilization.

Automatics Increase Business

DEVELOPMENT of automatic machinery in many cases provides the means for creating new business in the field for which the machines are intended. Employment of the new machinery also has the effect of improving industrial conditions and bettering the standards of living in general.

This especially is the case where certain operations on products formerly were not possible due to the excessive costs involved in hand work. An instance is to be found in the leading article in this issue of MACHINE DESIGN. Before the adoption of automatics, few workers were engaged in the wrapping of cigars in foil or transparent material. Since introduction of the new machinery however, it is estimated that about 20,000,000 cigars are wrapped daily, either wholly or in part by machines. As a result thousands of workers have found employment in this branch of industry and sales of both the product and the machinery for handling it have increased enormously.

Let design of automatic machines continue. And particularly so, in these times, where their use brings immediate and cumulative beneficial effects.



Miehle Two-Revolution Printing Press

Great Moments in Machine Design—Fourteenth of a series of original drawings prepared exclusively for this magazine symbolizing the designer's contributions to the progress of mankind

NOTEWORTHY PATENTS

A Monthly Digest of Recently Patented Machines, Parts and Materials Pertaining to Design

VARIOUS means have been employed for aligning thrust bearings and in view of its pertinence to the design of machinery, any invention of this kind is interesting to engineers who are faced with similar problems. This particular innovation of a thrust bearing aligning method was conceived by Mahlon E. Layne, Houston, Texas. The patent number is 1,759,-234 and Layne & Bowler Corp., Los Angeles, is the assignee.

One of the conditions that prompted the new method of bearing construction was the tendency of ordinary spring supports of bearing shoes toward failure due to not maintaining equal pressure on all segments. Consequently the oil film breaks down at different points and allows metal to metal contact, resulting in friction and wear of bearing surfaces. Moreover, the upper bearing member while forcing the spring-mounted shoes into alignment exerts an unequal pressure on one or more of the segments.

In place of using springs to accomplish alignment the author of this invention provides a permanently aligned bearing which eliminates the necessity of having to machine and construct accurately all parts of the bearing. One embodiment of his invention is shown in Figs. 1, 2 and 3. Stationary base member 1 is provided on its upper side with radially disposed abutments 2 on which rests a suspension plate 3. This plate may be wrought iron, low carbon steel or similar material which is deformable yet strong, and capable of being permanently set by pressure.

Fig. 4 — Developed vertical section of bearing. Fig. 5— Plan view of modified form of thrust bearing. Fig. 6— Means for setting the bearing in alignment

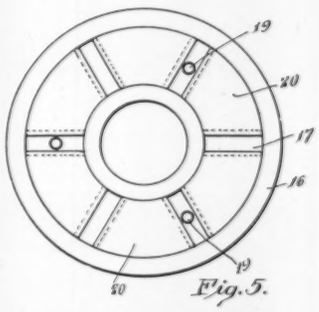


Fig. 5.

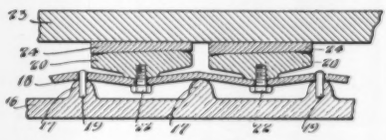


Fig. 6.

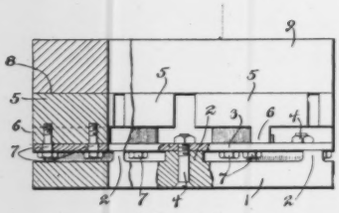


Fig. 1.

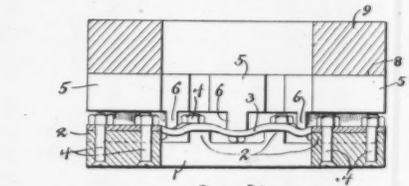


Fig. 3.

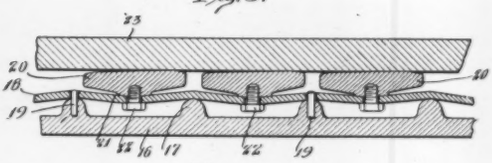


Fig. 4.

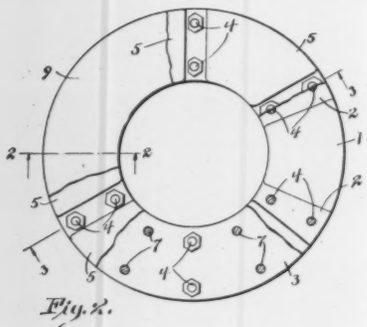


Fig. 2.

Fig. 1 — Thrust bearing with side broken away to show section on line 2-2 of Fig. 2. Fig. 2—Plan view of thrust bearing. Fig. 3—Bearing in finished position

Plate or ring 3 is secured to the base member 1 by bolts 4 passing through the abutments 2, on which the plate rests. Holes in the plate should be much larger than the diameter of the bolts. Supported on the plate 3, between abutments 2, are segmental bearing shoes 5. Bolts 7 secure the shoes to plate 3. After the plate and shoes have been put in place the upper faces or rubbing surfaces of shoes should be simultaneously subjected to pressure sufficient to produce a permanent set in the material of the plate between the abutments. Force may be applied to the upper bearing member 9, in which case the true face 8 will impart pressure to the series of segmental shoes.

By this construction, if one of the shoes is originally of greater height than the remainder,

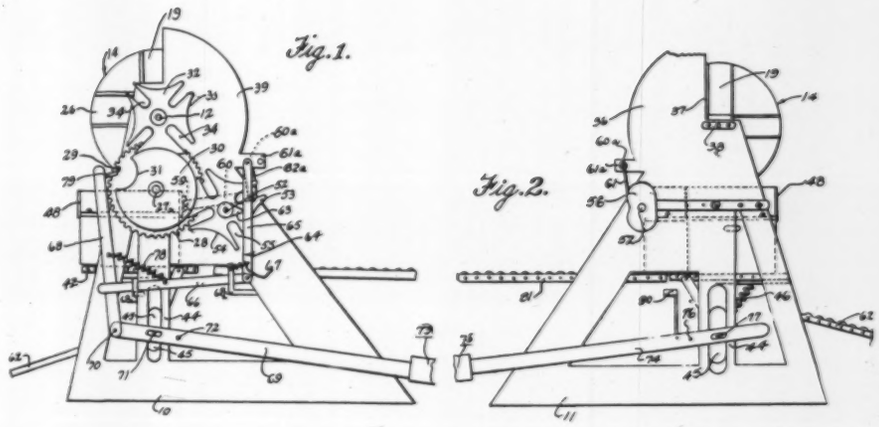


Fig. 1—Side elevational view of bottle handling machine, showing the combination of two star wheels and cam movement. Fig. 2—Opposite side of Fig. 1 showing second cam movement and member for guiding the bottles in the case

pressure upon the shoes will equalize their position, partly by drawing a portion of the plate from the adjacent shoe, thus lowering the elevated segment and raising the adjacent shoes. This hammock-like construction facilitates the deformable material in permanently aligning the bearing shoes.

Another form of the invention is shown in Figs. 4, 5 and 6. The same principle is employed in this type of construction and the wearing face of each bearing shoe 20 is set at a slight angle to the face, the object being to assist the oil in entering the space between the part 23 and the bearing shoes 20, so as to increase the film of lubricant. This permanent set may be produced by means of angle blocks 24, which are pressed downward by an object with a true surface. The force should be greater than the pressure which the bearing is designed to receive or support in operation, in order that bearing shoes 20 will be held unyieldingly in the desired aligned position.

THE geneva movement comprising a star wheel and cam provides the operating principle of a bottle handling mechanism designed by Edwin E. Van Cleaf, Detroit. United States patent office recently granted him patent No. 1,773,654 for his invention. The salient object of the unit is to provide a means for handling bottles in a manner capable of inserting them into cases neck downward, after they have been received from a filling and capping machine.

Through the arrangement of the mechanism a case after it has been filled, will be moved from the machine to make room for the next one. Accompanying illustrations show Figs. 1 and 2 as opposite sides of the apparatus, Fig. 3 the bottle receiving member, Fig. 4 a cam and Fig. 5 a star wheel employed in the device. Shaft 27 carries a gear 28 which receives its power from a pinion mounted on a motor shaft. Mounted on the outer face of the gear is a pin 29 which engages the slots in the star wheel 32 mounted on shaft 12.

The function of the cam 30 and star wheel 32 is to provide intermittent operation to the bottle receiving member 14, as the gear 28 rotates in a counter clockwise direction. A conveyor not shown, aligned with detail 38, Fig. 2, delivers the bottles into one of the compartments of 14. The operation of the capping unit and the bottle handling machine are synchronized in order that the movement of bottle receiver 14 will occur at a time when a predetermined number of bottles have been moved into a compartment of 14.

As the pin 29 engages one of the slots 34 of the star wheel 30 the bottle receiver 14 is rotated, carrying with it the bottles which have entered, for example, compartment 19 shown in an upright position in Fig. 2. Mounted on the opposite end of the shaft 52 from that carrying the star wheel 53 is a cam 56 which has a groove 57 in which the cam follower 58 is adapted to travel.

The quarter turn step-by-step movement imparted to the star wheel 53 will impart a similar movement to the shaft 52 and therefore to the cam 56. With the follower 58 in the cam groove 57 this movement will be imparted through the arm 61 to the shaft 60a and the links 60 to the bottle guide member 48, which will move in a manner such that it will properly

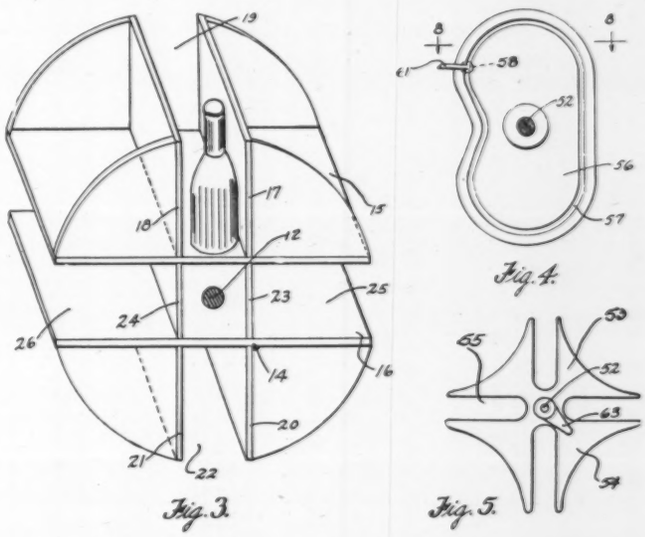


Fig. 3—Perspective view of bottle receiving member. Fig. 4—Elevational detail view of cam member employed in the device. Fig. 5—Detail view of star wheel and cam member

position the bottles to be inserted in the case.

Another cam member 63, on the opposite end of the shaft, is associated with star wheel 53 (Fig. 2). This operates L-shaped link structure 64, co-operating with arm 68. On the upper end of arm 68 is a projection 79 which is engaged by pin 29 when gear 28 rotates. This moves arm 68 downwardly and inwardly. At its lowermost position the arm engages cam 30 and projection 79 is disengaged from pin 29. When arm 68 moves downwardly similar movement is imparted to blocks 45 which move platform 42 downwardly, this action taking place after the case has been filled with bottles. After moving a predetermined distance the platform 42 engages the stop 80 and the forward end of the platform will be tilted into alignment with conveyor 62, which takes the filled case. Weights 73 and 75 counterbalance the weight of the full case and reposition platform 42 after the case is removed by the conveyor.

A COUPLING or clutch has been invented to provide a simple and efficient device capable of driving in one direction only without employing any member in constant contact which would cause friction or drag when the parts are not in driving relation. The device was designed and recently patented by William L. McGrath, Elmira, New York, and assigned to Eclipse Machine Co., Elmira. It carries United States patent No. 1,770,419.

Referring to the accompanying drawings, Fig. 1 is a sectional elevation of the coupling which is shown applied to two shafts in axial alignment. Fig. 2 is a similar view except that the axis of one shaft is shown at an angle to the other. Construction and arrangement of the coupling is such that the shafts will be properly connected together regardless of the angle of displacement of the shafts.

Driving shaft 1 is provided either separately or integrally with a screw threaded portion,

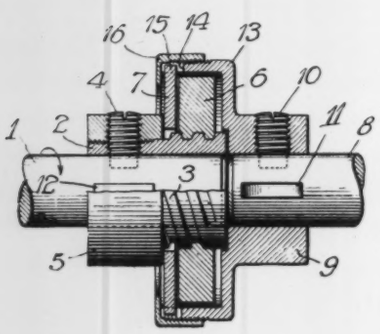


Fig. 1—Sectional elevation of coupling showing the two shafts in axial alignment

which in the illustrations is shown as a separate screw sleeve 2, having screw threads 3. It is fastened to the shaft by set screw 4 and has a collar portion 5 which is separate from the sleeve and screw threaded on it, being held in place by the same screw 4. Nut 6 is threaded upon the sleeve 2 and mounted for longitudinal movement of the sleeve and rotary movement with the sleeve. Plate or disk 7 is mounted loosely upon the sleeve and interposed between nut 6 and the collar 5.

A head 9 is secured to the driven shaft 8 by set screw 10 and key 11. This head is provided with a cylindrical extension or shell 13 which

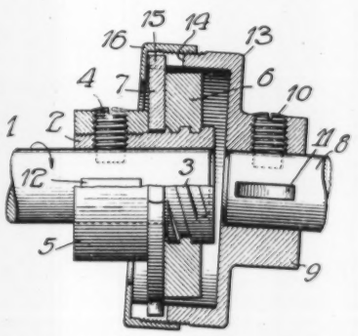


Fig. 2—View of coupling showing the axis of one shaft at an angle to the other

encompasses the nut and disk and also is interlocked with the disk. The shell and disk have tongue and slot connections, the slots in the shell being indicated at 14 and the tongues of the disk at 15. These slots are of greater depth than the width of the tongues, so as to provide some freedom or movement of the disk and shell. Ring 16 which is screw threaded upon the shell holds the latter in place.

In operation, starting with the parts in the position shown in Fig.1, the two shafts in exact alignment, are not drivingly connected, but at the first rotation of the driving shaft 1 the nut 6 will move automatically in a longitudinal direction to the left. As it does this it carries the disk 7 in the same direction until the disk is clamped firmly against the right hand side of the collar 5 by the screw action of the nut. In this position the disk is drivingly connected with the driving shaft and since it is at all times connected with the shell 13 and the driven shaft 8, torque will the transmitted therethrough.

Should shaft 8 become the driving member, the clutch connection would be broken automatically since the nut 6 would move to the right and relieve the disk from clamping action. As there is sufficient freedom of movement between the disk and the shell to permit misalignment of the shafts as shown in Fig. 2, there is no interference in operation when the latter condition prevails.

Review of Noteworthy Patents

Other patents pertaining to design are briefly described as follows:

SEMIAUTOMATIC TRANSMISSION. 1,772,029. "In a power transmission, the combination with driving and driven shafts coaxially disposed; of a member axially slidable as regards the driven shaft, means actuated by the driving shaft for revolving said member and at the same speed, internal spiral teeth on said member and

corresponding and spaced sets of external teeth on the driven shaft, and devices for sliding said member in and out of engagement with either set of said shaft teeth." Assigned to E. D. Bieretz and John T. Neal.

INTERNAL COMBUSTION ENGINE—1,773,196. In this invention a radial motor embodies a crankcase, an axially disposed crank shaft, an induction manifold directly back of the crankcase and secured thereto, and a tappet cam embracing the manifold and supported to rotate thereon. Assigned to Chevron Motor Corp., New York.

PISTON—1,766,449. Covered by this patent is a piston comprising a head, a skirt, the skirt otherwise being independent of the piston head, and piston pin bosses integral with the head, the bosses being cast about portions of the struts. Assigned to Bohn Aluminum & Brass Corp., Detroit.

DRIVING MECHANISM. 1,771,525. A driving mechanism including a motor shaft, a clutch mechanism comprising a disk fixed on the motor shaft, a drum and a clutch device there between comprising two actuating members and pivoted centrifugally operated weights connected to one of the members and adapted to move the other member to clutch the disk and drum together. Assigned to Tolhurst Machine Works Inc., Troy, N. Y.

MECHANICAL MOVEMENT. 1,772,243. This patent covers "the combination of a pair of pinions intermeshing to rotate in opposite directions, oppositely acting roll clutches for rotating said pinions, a pair of connected members for operating said clutches, a constantly rotating shaft, a lever device oscillated constantly from said shaft and connected to said members to oscillate the same in unison and thereby operate the clutches in unison." Assigned to Rotary Machine Co., Lynn, Mass.

MOTOR CONTROL DEVICE—1,773,130. This patent covers "an electric motor, a starting switch for said motor, a second motor, means whereby when said motor is opened the circuit of the second motor will be closed, kept closed for a predetermined time and then opened, and whereby when the first starting switch is closed, the circuit of the second motor will be closed again, kept closed for a predetermined time and again opened." Assigned to Stromberg Electric Co., Chicago.

BEARING KEY. 1,772,008. "A shaft having a curved bottom key seat, and a key having a convex side slidable against the curved bottom, and having its opposite side also convex, a member on said shaft having a straight key seat engaged by the key, said key being of less width than the greatest combined depths of the seats to permit rocking of the key, and a jamb screw in the member engaging with one end of the key and forcibly securing the hub in position on the shaft." Assigned to Fairmont Railway Motors Inc., Fairmont, Minn.

OIL PUMP—1,765,914. "In a gear pump for a lubricating system, the combination with a pair of gears meshing with each other for pumping a fluid, and means for driving one of the gears, said gearing having an inlet passage extending from one side thereof around one of said gears and into a position to deliver all the fluid to the inlet side of the gears on the opposite side of said casing, and an outlet passage from the gears direct on the same side of the casing as the inlet passage and adjacent thereto." Assigned to Leland-Gifford Co., Worcester, Mass.

Factors in Choosing System of Lubrication

(*Concluded from Page 40*)

study of lubrication has been made have adopted one of the new methods of high pressure lubrication. It is an advantage to designers and builders of machinery, if they standardize on a system of lubrication which has been accepted throughout the industry in which those machines will be placed in operation.

Because of the fact that high pressure lubrication systems are flexible in that they may be installed on any piece of equipment, it is estimated that slightly more than twelve thousand industrial plants are using them today. Such a factor should be considered of vital importance.

6. In recent years the National Safety Council has busied itself in an endeavor to better the working conditions in machine shops, factories and industrial plants. They have been successful in their attempts toward making machinery safe for its operators.

A very large percentage of the accidents in American industries occur when machinery is being lubricated. It is unsafe for a man to climb over machinery to reach inaccessible bearings. It is unsafe for him to reach about moving gears and wheels to screw down oil cups or pour oil into a reservoir.

The safety element is very highly considered by purchasers of machinery. If it is equipped for high pressure lubrication, the operator is never in danger of losing an arm or a hand.

7. Finally, the sales advantage of a lubricating system should be considered. If it is a system which is known to save money for its users; if it is recognized as a simple, positive system; if it is a system which, because of its merit, has received the approval of machinery users and builders throughout the field in which you operate—it can become one of the leading sales features of your product, in the same way that nationally advertised metals, gears, and bearings now are considered by machinery buyers.

A new mail metering device with improvements designed to expedite the handling of all business mail just has been approved by the post office departments at Washington. The meter may be set by the postmaster for a certain amount of postage, locking automatically when the amount has been reached.

It is adapted particularly to the mailing of parcels requiring different amounts of postage and is able to stamp from one-third cent to $9.99. The meter prints on a sticker or label the amount of postage, the date and place of mailing, weight and serial number of the particular piece, permit number and meter number.

MEN OF MACHINES

Personal Glimpses of Engineers, Designers, and Others Whose Activities Influence Design

BESIDES his achievement as editor of "Kent's Mechanical Engineers' Handbook," Robert T. Kent also has set a mark in the field of industrial engineering. As an author of technical papers as well, his activity in this direction further is augmented by his contribution at the recent meeting of the machine shop practice and iron and steel divisions of the American Society of Mechanical Engineers at Chicago. Mr. Kent was graduated from Stevens Institute of Technology in 1902 with a degree in mechanical engineering. In 1905 he entered editorial work and his early associations included the Penton Publishing Co., Cleveland. Later he engaged in industrial engineering and after eight years returned to editorial work to rewrite the handbook. Some years later he was made general manager of the Bridgeport Brass Co., Bridgeport, Conn., resigning in 1928 to become manager of sales and engineering departments of Divine Bros. Co., Utica, N. Y.

WITH a penchant toward inventing Leon Cammen has to his credit, among others, the design of a machine for casting billets centrifugally. His broad engineering experience and training has fitted him for consulting practice, in which he now is engaged in New York. In addition he is associate editor of *Mechanical Engineering,* and delivered a paper at the recent meeting of the machine shop practice and iron and steel divisions of the American Society of Mechanical Engineers at Chicago. Mr. Cammen was born in Russia and attended the University of St. Petersburg, graduating with a bachelor of arts degree. He received his master's degree at the University of Illinois.

FORTY years of service with Pratt & Whitney Co., Hartford, Conn., recently was completed by W. H. Miller. In honor of the occasion his associates recently presented him with a gift at a fitting celebration. Mr. Miller entered the employ of the Pratt & Whitney company on June 30, 1890, in the engineering department. While in this division he assisted in designing and drawing up special machines for producing sewing machine parts, type H drills and certain of the milling machines of that time. In 1897 he joined the selling organization and has been identified continuously with it since. He now is the New England sales manager of the company.

PIONEER in magnetic testing of steel and designer of the first commercial machine for continuous nondestructive testing of strip steel, Dr. Sigfrid Specht holds an enviable engineering record. Formerly associated with the Magnetic Analysis Corp., Brooklyn, N. Y., he resigned recently to become vice president and chief engineer of the Ferrous Magnetic Corp., New York. Dr. Specht was born in Elberfeld, Germany, of a family of engineers and attended the Institute of Technology in Berlin. Later he studied at the Polytechnic institute in Paris and Trinity school, Dublin, Ireland. Coming to this country he became a research engineer and technical advisor and while stationed at Pittsburgh took several courses at Carnegie Institute of Technology. It was in 1924 that he became chief engineer of the Magnetic Analysis Corp.

AMONG the vice presidents recently elected by the American Society of Mechanical Engineers is William A. Hanley. He is director of engineering of Eli Lilly & Co., Indianapolis. Born at Greencastle, Ind., December 13, 1886, Mr. Hanley obtained his preparatory training at St. Joseph's college and subsequently spent five years with Republic Iron & Steel Co., and Broderick Boiler Co., both at Muncie, Ind. After graduating in mechanical engineering in 1911 from Purdue university, he joined the Lilly company. His major efforts have been in the design and application of pharmaceutical and chemical machinery and appliances, development of straight line production machinery and methods, and industrial engineering as applied to manufacturing plants. Mr. Hanley is a contributor to the technical press and a member of a number of engineering societies.

MANAGER of the American Society of Mechanical Engineers is the office to which Herbert L. Whittemore, chief of the engineering mechanics section of the bureau of standards, was elected in September. Milwaukee was the place of his birth in 1876 and in 1903 he was graduated from the mechanical engineering

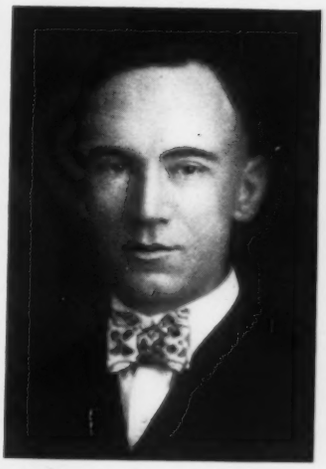
Leaders in Design, Engineering and Research

ROBERT T. KENT

LEON CAMMEN

W. H. MILLER

DR. SIGFRID SPECHT



WILLIAM A. HANLEY

H. L. WHITTEMORE

course at the University of Wisconsin. Late in 1906 Mr. Whittemore accepted an appointment at the University of Illinois, to take charge of all undergraduate instruction in testing materials and hydraulics. Four years later he became engineer of tests at Watertown arsenal and in 1912 joined the faculty of Columbia university as instructor in mechanics, from which position he resigned in 1916 to accept the chair of mechanics at the University of Oklahoma. Since 1917 he has been with the bureau of standards, Washington.

* * *

Claude O. Streeter has become chief mechanical engineer of the Schwartz Belting Co., New York, to assist the company's clients in solving power transmission problems. He formerly was chief mechanical engineer of the Graton & Knight Co., Worcester, Mass.

* * *

G. A. Reinhardt has been elected to the board of directors of the American Society for Testing Materials. He is director of metallurgy and research for the Youngstown Sheet & Tube Co., Youngstown, O., with which company he has been associated since 1913.

* * *

George Gibbs, international authority on electrification of railways and for many years designer and constructor of equipment, mainly electrical, recently was made the recipient of the honorary degree of doctor of engineering by Stevens Institute of Technology. He is a member of the firm of Gibbs & Hall, consulting engineers, New York.

* * *

Conrad A. Teichert has accepted a position in the research division of the Bendix Brake Co., South Bend, Ind. He formerly was engine designer and mathematician for the International Harvester Co., Fort Wayne, Ind.

* * *

George R. Davenport, formerly on the engineering staff of the Studebaker Corp., and more recently with the Graham-Paige Motors Corp., has taken a similar position with the Hupp Motor Car Co., of Detroit.

* * *

Leo Matthews, formerly designer for the Natco Co., Richmond, Ind., recently joined the Marmon Motor Car Co., Indianapolis, as tool designer.

* * *

Eric Zachau has resigned as western sales manager, Manning, Maxwell & Moore Inc., New York. When he arrived in this country in 1903 he became electrical engineer at Shaw Crane works, Muskegon, Mich., where he remained until 1915, when he was transferred to Pittsburgh as sales engineer. In 1920 he was made chief engineer. He was works manager for seven years and early last year was appointed western sales manager.

* * *

G. S. Von Heydekampf has resigned as engineer of tests, Babcock & Wilcox Co., Bayonne, N. J., to become research engineer of the Southwark Foundry & Machine Co., Philadelphia. Prior to entering the United States four months ago, he was assistant to Prof. O. Foeppl of the Technical High school, Brunswick, Germany.

* * *

Mark Birkigt, designer of the Hispano-Suiza aircraft engine and the automobile of the same name, and M. Thiry, inventor of the Silentbloc rubber spring connection, have been named members of the French Legion of Honor.

* * *

Wayne H. Worthington, formerly chief engineer of the Gleaner Combine Harvester Corp., Independence, Mo., has been appointed research engineer with the John Deere Tractor Co., Waterloo, Iowa.

* * *

Scott F. Hunt, formerly sales engineer of Bendix Stromberg Carburetor Co., South Bend, Ind., has been appointed assistant chief engineer.

* * *

Reinhold Schneider, chief engineer of the Farrell works of the Carnegie Steel Co., at Sharon, Pa., resigned effective July 4 after more than 35 years active service.

* * *

William B. Mayo, chief engineer of the Ford Motor Co., Detroit, was re-elected chairman of the Michigan state board of aeronautics at a recent meeting. He became chairman of the board shortly after its organization last year.

* * *

A. B. Pearson, engineer, Carnegie Steel Co., Munhall, Pa., presented a paper, "General Design and Construction of Hot Saws for Cutting Heavy Sections," at the recent meeting of the American Society of Mechanical Engineers at Chicago.

* * *

E. B. Nichols has been appointed chief engineer of the Brown Instrument Co., Philadelphia. He was at one time chief engineer of the Pfandler Co., Rochester, N. Y., subsequently holding the same position with the Victor Talking Machine Co., Camden, N. J. Later Mr. Ni-

(Concluded on Page 76)

TOPICS OF THE MONTH

A Digest of Recent Happenings of Direct Interest to the Design Profession

OPENING of the special exhibit, "Men and Machines," on Sept. 12 by the Museums of the Peaceful Arts, New York City's museum of science and industry, marked the first effort in America to depict in condensed form the sequence of scientific discoveries, inventions and machine improvements, which have transformed industry and society during the past 15 decades. The exhibit will be open to the public without charge until Nov. 15, and is being held in the News building, 220 East Forty-second street, New York.

More than 200 companies and individuals of national standing have been included in the museum's story of "Men and Machines." Among the exhibits, in the form of models, machines or graphic devices, there is shown early and modern locomotives, telephones, textile and agricultural machinery, presses and printing accessories, sewing machines, automobiles, airplanes, bicycles and radio apparatus.

Power is portrayed as the life blood of the machine age, and in this section of the exhibition is its history, beginning with the earlier forms of power generating equipment such as Watt's steam engine. Development of metallurgical sciences are shown in relation to the successive accomplishments of the iron age, steel age and the age of alloys. Primitive, intermediated and modern tools and machines, many in operation, present a dramatic story of the industrial advances which these factors have made possible.

* * *

Machines Win Over Hand Picking Method

Mechanical cotton pickers and corn huskers, innovations in machine design, bid fair to entirely replace the hand picking method. Tests conducted by the textile department of the Texas Technological college in the Texas cotton country reveal that the machine-picked product makes a little better showing than the hand-picked, according to a recent article in the *Textile World*. While the machine used in the cotton fields has not reached its height of development, its possibilities promise to fill a specific need.

Development in the design of corn pickers has made rapid strides during the past year. Several 2-row machines now are available, while a few years ago there was not one on the market. Some of the new models are equipped with wheels to be pulled and others are mounted on tractors. All of these machines operate by power from the tractor, a feature which largely has been responsible for their success. About 8 acres daily may be husked with a one-row outfit, and 14 or 15 acres is not a difficult task for the 2-row machine. One man operates the entire equipment, thus greatly reducing the amount of labor formerly required to perform work.

* * *

Diesel Standards Booklet Is Published

The Diesel Engine Manufacturers' association has prepared a 60-page booklet entitled "Standards of the Diesel Engine Manufacturers' association." It includes chapters on standard principles of business, standard practices, notes on the selection and installation of stationary diesel engines, and standard definitions. Sustaining-members of the American Standards association interested in diesel engines may obtain a copy for review through the information service department.

* * *

Memorial Honoring Inventor Is Dedicated

The memorial to George Westinghouse, inventor and founder of the industries which bear his name, was dedicated Oct. 6 at Schenley park, Pittsburgh. The vast attendance at the ceremony included leaders of industry, science, art and education. Fitting tribute was paid to the genius who conceived the air brake, developed the steam turbine and was the proponent of alternating current. The bronze group of heroic proportions were created by Daniel Chester French, American sculptor.

* * *

Rayon Machinery Show Held in Germany

Marks of progress made in design of German rayon machinery were impressive features of the rayon machinery show recently held at Frankfort, Germany. Representatives of many countries attended and saw numerous important steps toward more efficient equipment. The automaticity of a bobbin spinning machine for viscose rayon was indicative of the trend. In this machine regulation of the number of revolutions of the bobbins during the spinning process is

effected by special motors. controlled by a counter mechanism. A bobbin spinning machine for acetate silk also was shown, but a special chain drive instead of electrical means regulates the bobbins. This unit also operates automatically and is provided with a casing for the spinning parts proper, a matter of importance in recovery of the solvent.

* * *

Senate Postpones Action on Museum Bill

The bill to establish a national museum of engineering and industry was left pending, following postponement of action in the Senate. It was introduced by Senator Royal S. Copeland, of New York, and was brought up on the calendar in June. Senator Jones, of Washington, however, objected to hasty consideration of so important a measure.

In view of his contention that there should be more opportunity to study the matter the bill was passed over. Senator Copeland's bill proposes the establishment of a suitable museum for engineering and industrial exhibits and authorizes creation of a commission to study the matter.

* * *

Chain and Sprocket Standard Is Approved

The American standard for transmission roller chains, sprockets, and cutters developed by the sectional committee under the sponsorship of the Society of Automotive Engineers, American Society of Mechanical Engineers, and American Gear Manufacturers association has been approved by the American Standards association. The standard covers roller chains, sprockets, and cutters, commonly used for the transmission of power in industrial machinery, machine tools, motor trucks, motor cycles, and tractor drives, and similar applications.

According to the foreword to the standard "the sizes, dimensions, and other data are for standard steel chains that are considered suitable for all usual applications. Adoption of the standard does not indicate that other chains will not be obtainable for use where they may be required. It is recommended by the sectional committee that chain manufacturers be consulted by users in their selection of chains for given applications in order to obtain the best results in operation." Copies of these standards now are available and may be obtained through the American Standards association information service for fifty cents per copy.

* * *

Find Production Method for Beryllium

A new method for the production of pure metallic beryllium has been discovered by Prof. Harold S. Booth and Miss Gilberta G. Torrey, both of Western Reserve university, Cleveland. The announcement was made before members of the American Chemical society in fall meeting at Cincinnati recently.

"Beryllium is the lightest known metal that is not corroded in air," stated Professor Booth in discussing the value of beryllium. "Alloys of beryllium with aluminum have been reported which have the strength of steel and the lightness of aluminum. Such alloys should be of tremendous value in reducing the weight of heavier-than-air craft and in other places where light weight and strength are more important than cost."

* * *

Machinery Exhibited at Petroleum Show

Designers interested in the construction of equipment used in the petroleum industry were directed in their thoughts toward the International Peroleum exposition during the week of Oct. 6 when it was held at Tulsa, Okla. The event took place simultaneously with the National Petroleum meeting sponsored by the petroleum division of the American Society of Mechanical Engineers. One of the special technical exhibits was an automatic pumping station constructed by a research committee of the society. Over 300 exhibits comprised the exposition and among them was the initial showing of new type equipment for controlling the operation of remote, automatic electric devices by means of audio-frequency impulses.

* * *

Research Facilities Cited in New Booklet

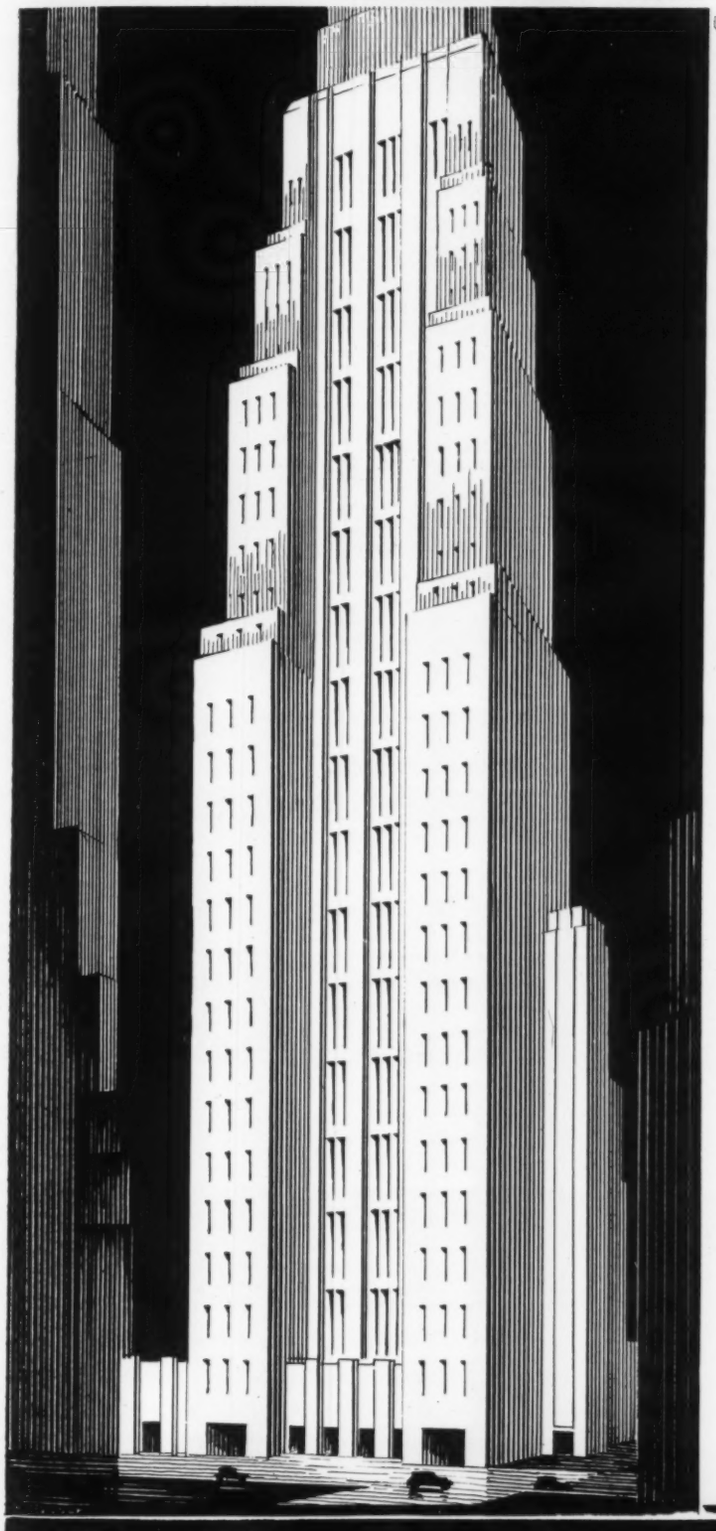
To depict to industry its facilities for conducting research, Battelle Memorial institute, Columbus, O., is distributing an attractive 32-page booklet entitled "Research in Industry." The institute, only recently established, is not organized for profit and is self-sustaining from an endowment. However, industrial concerns engaging the research facilities are expected to carry the costs of these projects.

* * *

Foundry Equipment To Be Standardized

Under the joint request of the American Foundrymen's association and the American Society of Mechanical Engineers, the American Standards association has organized a technical committee to undertake the standardization of foundry equipment. The Foundrymen's association would include in the project the standardization of such equipment as pattern plates and molding machine parts affecting the interchangeability of patterns, flask pins and holes, general dimensions of flasks for jobbing work, ladle and ladle shank sizes, ladle sleeves, stoppers and nozzles, stock core and print sizes, shapes and finishing allowances, pattern markings, rapping plates, fillet sizes and dowel pins for metal patterns and core boxes.

TOWARDS THE SKY



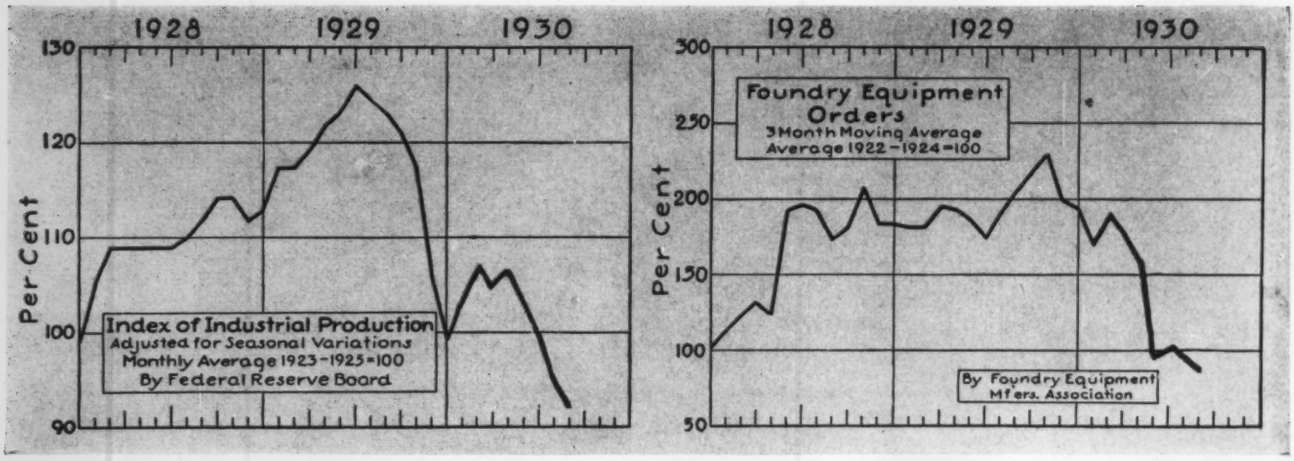
Higher and ever higher the genius of architecture soars towards the sun on wings of steel. ¶Vertical cities thrust their serrated towers into the clouds while deep below the surface of the earth they rest on solid rock. ¶Skylines change. Change again before the seasons complete their cycle. ¶In the area of one small plot of ground the compressed activity of a fair sized city is found. Chrysler—Chanin—Fisher — Woolworth — Wrigley—translate their personalities to the nation in terms of steel and stone. ¶In these temples of commerce the epic stories of American success are written where all may read. And on each page of the history recording the development of this new and modern architectural design, it is a source of constant gratification that cold finished steel bars play an important part. ¶For the success of each present day building is based on intramural transportation. Only to the limits fixed by the elevator system can the multiple-story structure be carried. ¶For vitally important parts of motors and other operating machinery, as in hundreds of places where the safety of countless lives rests on the material used—*no other material takes the place of Columbia cold finished steel bars.*

COLUMBIA STEEL & SHAFTING CO.

Mills and General Offices, Pittsburgh, Pa.

COLUMBIA

COLD FINISHED BARS AND SHAFTING

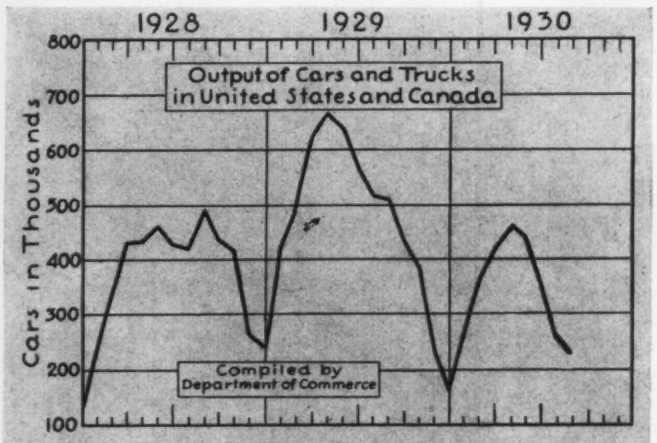


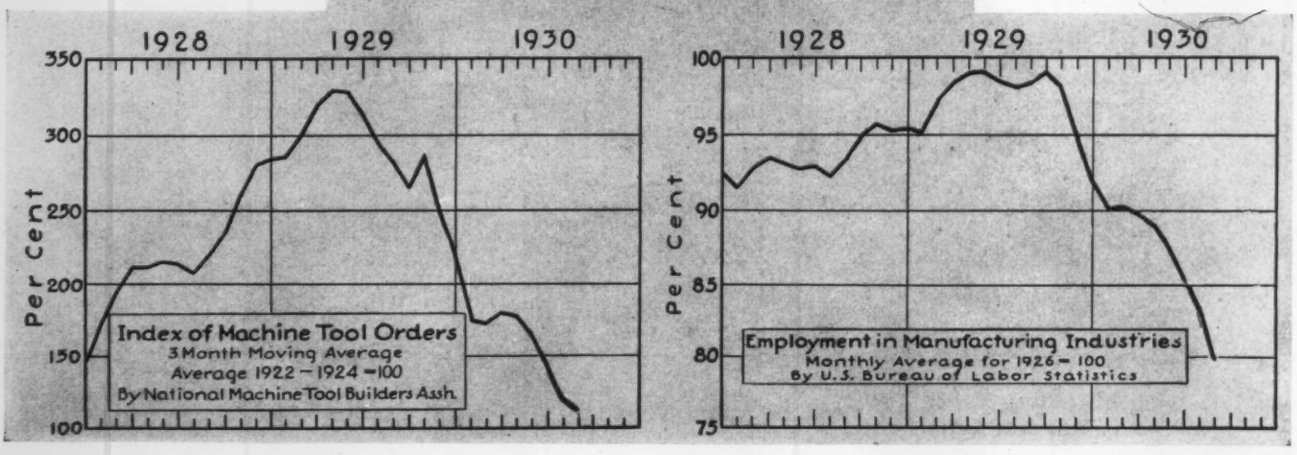
How Is Business?

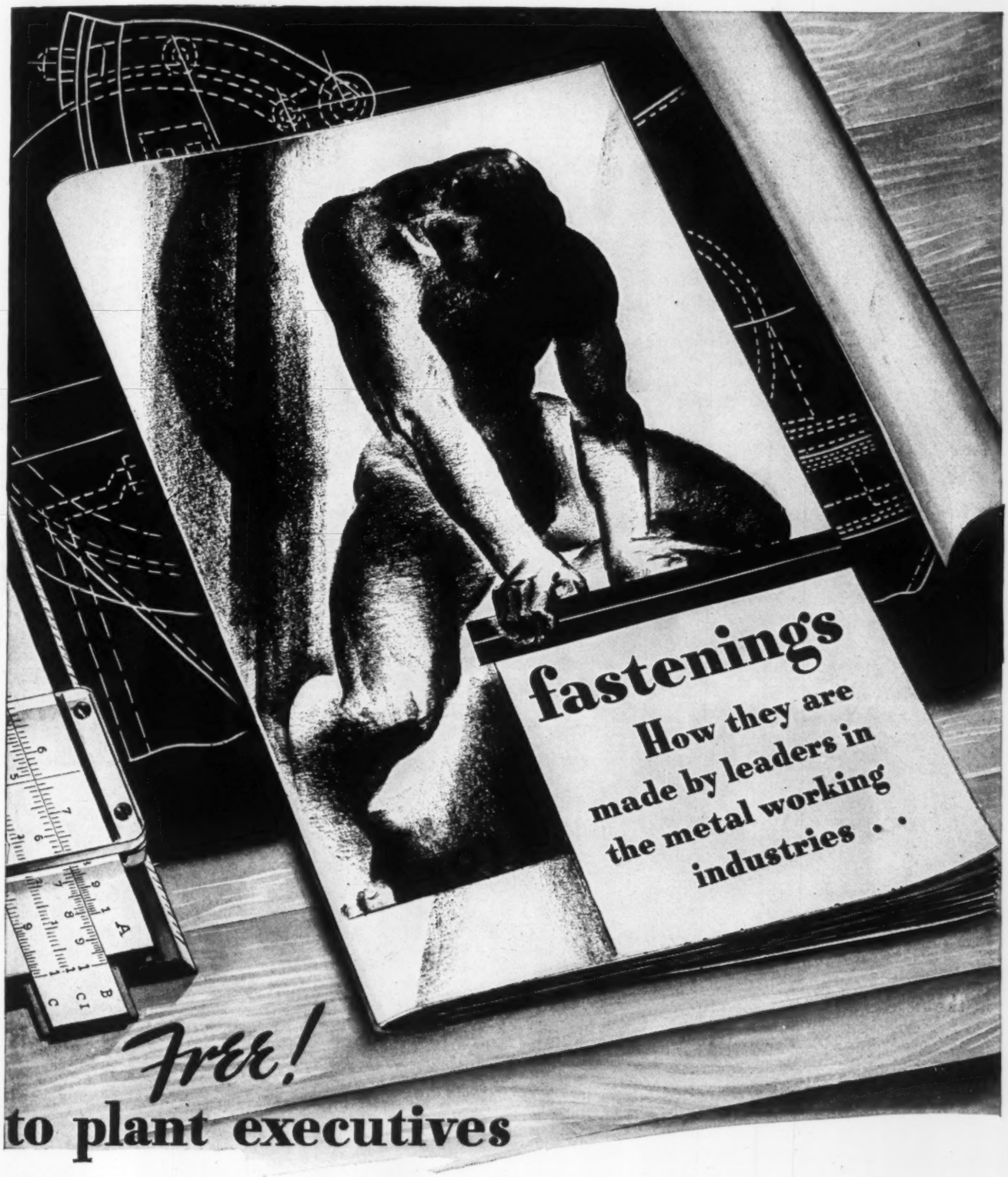
ENCOURAGING signs continue to brighten the business horizon and although cautious, industry is pursuing its slow tedious climb upwards. Statistics released the latter part of September augur well and reports from various sections of the country indicate that conditions are advancing to a more secure position. Buying generally is improving.

In the automotive industry little is being accomplished and builders seem to be holding up production, awaiting an increase in orders. Stocks in other departments of industry are not being augmented for the same reason. However machine orders actually increased in August though the gain was not sufficient to effect an upturn in the three months' moving index. A large Milwaukee company reported that it booked more orders for hydraulic feeds during a mid-September week than any comparative period so far this year. Sales of broaching machines and hydraulic presses also improved. Inquiries are coming freely from miscellaneous machine users in all sections of the country.

Steel's composite of 14 iron and steel products on October 2 stood at $32.56, a decline of eight cents from the previous week. In the Chicago district the more liberal release of fourth quarter specifications from implement makers indicates some improvement in this class of the machinery building industry. The unemployment situation was worse in 1921 than it is now, according to some authorities in business.







Free! to plant executives

This book was prepared for you with the cooperation of fourteen of the most prominent manufacturers in their respective fields, who permitted a nationally known firm of engineers to enter their plants and make studies of fastening methods which have proved particularly advantageous.

Every plant executive who is interested in the production of a product made wholly or partly of metal will find "Fastenings" interesting and helpful. Distribution of the book must be limited to those concerned with production, who may obtain it free.

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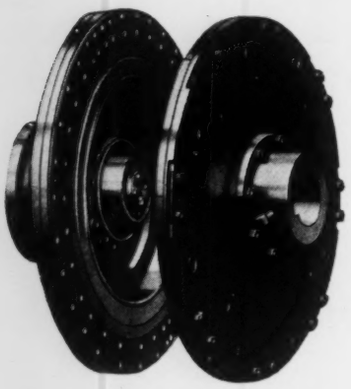
NEW MATERIALS AND PARTS

Worthy of Note by Those Engaged in the Design of Mechanisms or Machines

Magnetic Clutch Designated Type L

BETTER and more consistent operating characteristics, easier installation, greater safety, and convenient access to parts, are claimed for a new line of magnetic clutches recently announced by Cutler-Hammer Inc., Milwaukee. These new clutches, known as type "L," because of the shape of the armature, the cross section of which is "L"-shaped so that it fits around the magnet coil. This gives a greater and more steady magnetic pull throughout the life of the lining.

The magnetic coil is wound on a sheet metal



Magnetic clutch is constructed to permit removal of entire coil by the loosening of four studs. Armature is L-shaped to fit around the coil, terminals of which are recessed below surface of field member

form, vacuum impregnated before it is inserted in the field member, locked in place by means of four mounting studs which extend through the field casting. Loosening the four studs allows removal of the entire coil, the terminals of which are recessed below the surface of the field member to protect them against damage. A centering bearing, which is a roller bearing mounted in the field member and which protrudes so that it fits into a recess in the armature hub, forms a common support for both clutch members, yet allows either member to revolve independently of the other, when disengaged.

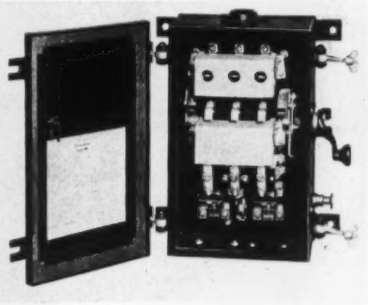
Improvement has been made in the design of the collector rings for these clutches. Rings are made of brass to prevent corrosion and are mounted away from the hub, on four insulated studs, so that it practically is impossible for sufficient dust to collect to cause creepage between the rings. Two carbon brushes are used on each collector ring so that one brush is always in position to give good contact without arcing. A lining wear indicator shows the operator when the lining has worn to a point where it must be readjusted.

Paints Are Resistant To Corrosion

CORROSION-RESISTANT paints for the protection of iron and steel equipment and structures recently have been developed by the Semet-Solvay Co., New York. Special formulas brought out by this company are for resistance to weather, use on high temperature apparatus, shielding structural iron against acids and fumes, counteracting soil corrosion, etc. As new requirements grow, a constant program of development, research and tests, is being carried out.

Starter Enclosures Are Dust Tight

DUST-TIGHT enclosures for across-the-line and combination starters recently were introduced by the Industrial Controller division of the Square D Co., Milwaukee. The illustration shows the class 8532-S starter in the new dust-tight enclosure. This new type of unit

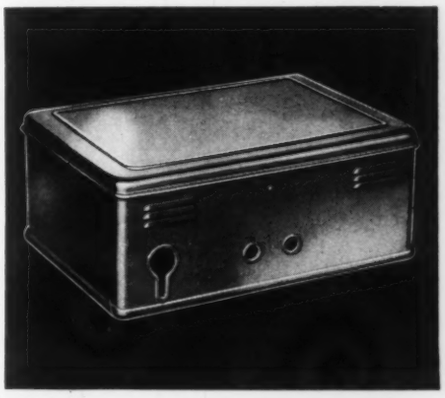


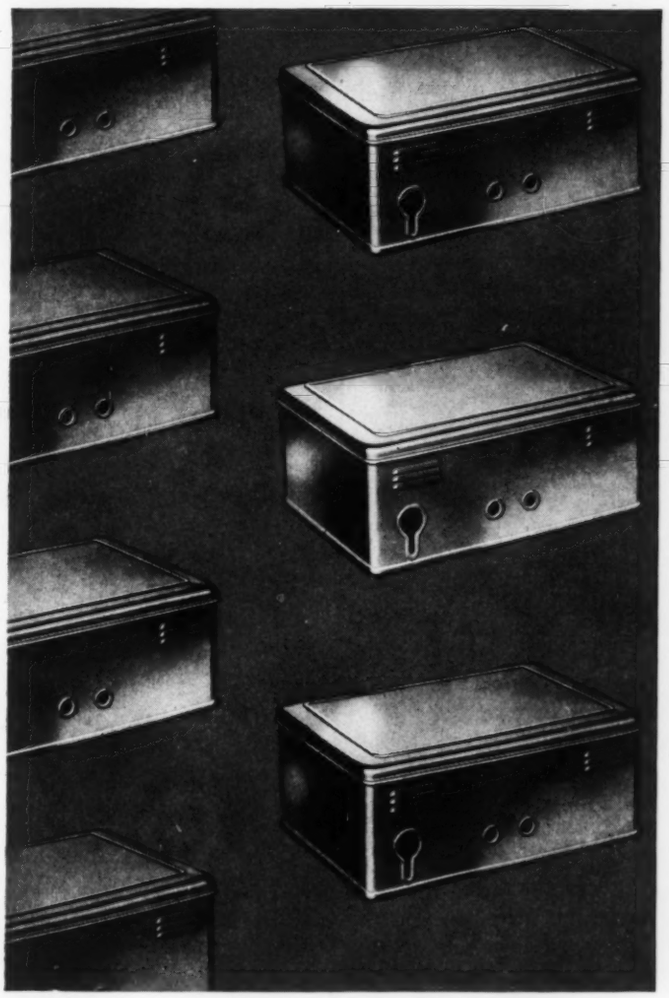
Dust-tight enclosure of heavy gage steel. Door has a deep flange for fitting around cabinet to seal the unit

has been developed for use in such places as foundries, cement mills, flour mills, etc., and for those applications where special protection must be had against excessive dust which may impair the operation of electrical equipment.

Cabinets are heavy gage steel with heavy strap iron mounting brackets. Cast iron conduit flanges with live rubber gaskets are furnished on top and on the bottom of the cabinet

WHY Metal Stamping Quotations Vary So Much . . .





The essentials in producing this radio cabinet were interchangeability of parts to save assembly time, and attractive appearance. G. P. & F. engineers found a way to combine these two elements successfully and economically.

IMPORTANT FACTORS to Consider in Bids You Get

WHEN quotations on metal stampings vary considerably, experienced buyers do find out the reason for the difference before placing the order.

Often it is found that the blueprint submitted is made up with a casting in mind, or with features which are not practicable, or without specific tolerances indicated. Naturally, such blueprints are interpreted differently by the various bidders, which reflects in the quotations.

In securing bids all of these factors should be taken into account, especially the correct indication of tolerance requirements, as tolerances affect the piece price very materially. This procedure provides a definite basis for all bidders to work on, and prevents trouble later on.

The final consideration is the stamping experience of the bidders. G. P. & F., this year celebrating its fiftieth anniversary, has the background necessary to appreciate the problems involved in practically every kind of light weight and medium stamping. Thus, in addition to quoting intelligently G. P. & F. is able to offer suggestions that often not only improve the design but lower production cost as well.

Why not consult G. P. & F. for suggestions and quotations?

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(A-1112)

to insure dust-tight conduit connections. As seen in the illustration the door has a deep flange for fitting around the cabinet. A heavy felt gasket is fastened inside the door by heavy metal strips and tightly clamped against the wide cabinet flanges by means of hinged bolts.

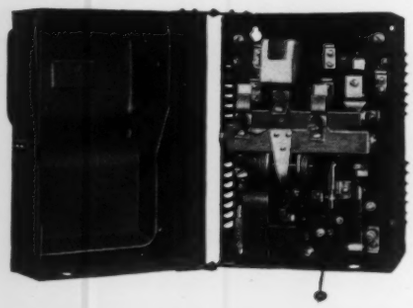
Two or more straps are provided on the door cover to receive the hinged bolts. The right hand ends of the straps are slotted to permit the hinged bolts to swing free. Left hand ends are drilled so that the cover swings on the bolts acting as a door hinge. Cabinets and conduit flanges are enameled and hinge bolts and other exposed metal parts are cadmium plated. For the thermal overload relays a dust-tight push button is furnished in the side of the cabinet for resetting the relays from the outside.

Time Starter Is Remote Controlled

REMOTE controlled magnetic time starters, designated class 8512, for constant and adjustable speed direct current motors in sizes up to 10 horsepower, 230 volts, recently were announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. They provide three points of definite time limit acceleration, permitting safe and accurate starting of the motor under full or partial load.

Four combinations of these starters make them applicable to a wide range of uses in industrial and building applications. Class 8512-A, for constant speed motors, does not provide overload protection nor dynamic braking. Class 8512-B for constant speed motors, supplies thermal relay overload protection but not dynamic braking. Class 8512-C, for constant speed motors, furnishes overload protection and dynamic braking. Class 8512-F, for adjustable speed motors, provides overload protection, dynamic braking and full field starting.

Time starters can be operated by all types of master switches, such as push buttons, shipper rod master switches, float switches, pressure



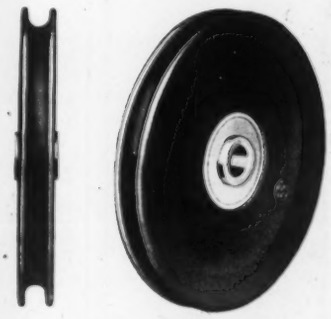
Starter for adjustable speed motors provides overload protection, dynamic braking and full field starting

switches, etc. Momentary contact push buttons and shipper rod master switches provide low voltage protection which prevents the motor starting again after a voltage failure until the master switch is operated. Low voltage release is obtained with maintained contact push buttons, float switches and pressure switches.

Pulleys Are of Molded Compound

MOLDED compound pulleys for various industrial and other applications have been announced by General Electric Co., Schenectady, N. Y. Four sizes are included in the line with

Molded compound pulleys made in four sizes and in various combinations of pin diameters and bearings



outside diameters of 1¼, 2½, 2 and 3½ inches.

Pulleys are made of "Textolite" molded around ball bearings. The bearings are of the single-row, self-contained type with dust shields and the molded material is fabric filled compound. The four sizes are supplied in various combinations of pin diameters and bearings. The 1¼-inch pulleys have plain sleeve bearings for 3/16 or ¼-inch pins, or ball bearings for 3/16-inch pins only. The 2-inch size covers plain sleeve bearings for ¼ or ⅜-inch pins or ball bearings for ¼-inch pins. The 3½-inch pulleys are either plain sleeve bearings for ¼ or ⅜-inch pins or ball bearings for ¼ or ⅜-inch pins. All the sizes but the 3½-inch ball bearing pulleys are new, these having been previously announced.

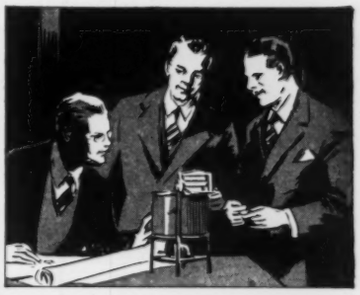
Develops New Type Welding Rod

OXYACETYLENE welding is one of the most effective methods of making joints in both sheet aluminum and aluminum castings, and little difficulty has been experienced in the past in the welding of commercial aluminum (2S), the aluminum manganese alloy (3S), and the strong aluminum wrought alloys (17S, 25S and 51S), provided the metal is free to come and go with the thermal expansion and contraction of the joints being welded. Oxweld Acetylene Co., New York, has introduced a new welding rod, designated Oxweld No. 23 aluminum rod, which is recommended for welding either aluminum sheet or castings when the metal is held tightly in jigs, and is not free to move.

The new welding rod is recommended for

SAFE For

ENGINEERING



PRODUCTION

SALES

THAT products sell with less resistance when equipped with Johnson Bronze Bearings is a fact—easily proved. ▼ Of equal interest, however, is the efficiency and economy these popular bearings promote thruout every phase of engineering and production. ▼ Made to conform exactly to specifications, Johnson Bronze Bearings may be relied upon to provide easy application and to supply a service in keeping with the product of which they become a part.

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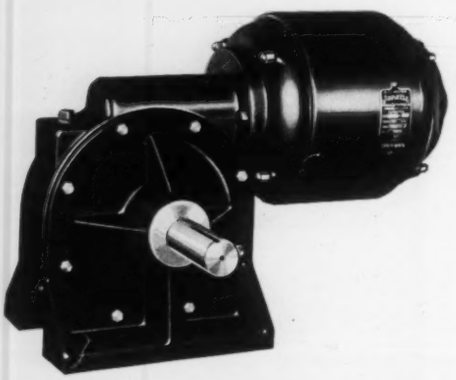
BUSHINGS BEARINGS BAR BRONZE

welding aluminum casting alloys because of the fact that its melting point is lower than that of the metal being welded, so that it will remain in the molten state after the base metal has solidified. The weld metal will therefore fill in any voids that may have been created by the solidification and contraction of the base metal. Oxweld welding rod coalesces readily with all of the aluminum alloys and possesses high strength and good corrosion resistance. It should always be used with Oxweld sheet aluminum flux, and is available in 1/16, ⅛ and ¼-inch sizes.

Designs New Type Speed Reducer

NOVEL features of design and construction are embodied in the new motor driven speed reducer recently announced by Janette Mfg. Co., Chicago. Designated type RW-2, the new unit, shown in the accompanying illustration, has the gear housing bolted directly to a machined pad on the end frame of the motor.

The gear box itself is divided into three parts, the main housing which is bolted to the end

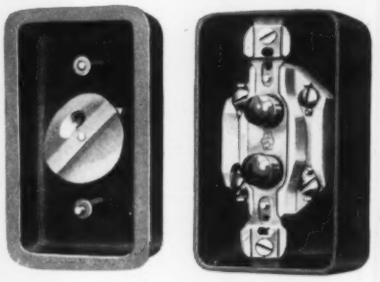


Motor driven speed reducer capable of being mounted in 12 *positions*

frame, and two sides. While the gear housing remains fixed, the two sides to which the mounting feet are cast, are movable. By removing the eight hex nuts holding each side plate to the main housing, the plates may be turned to any desired position, thus enabling the speed reducer to be mounted on the floor, wall or ceiling. Twelve mounting positions are possible with the unit, which according to specifications has a right or left shaft extension. It is available with ratios of 50, 60, 70, 90, or 100 to 1, and with motors of 1/6, 1/4 or 1/3 horsepower.

Switch Construction Is Simple

MOTOR driven pumps, compressors, and similar machines which are controlled by an automatic pilot device such as a float switch, pressure switch, time clock, etc., often require some means of starting and stopping the motor manually. For this purpose, Cutler-Hammer Inc., Milwaukee, has developed a new three-position pilot switch. The operating lever can be placed in either the "automatic," "off" or "manual" position. When turned to "automatic," the



Three position pilot switch showing push buttons and cam attached to operating lever

pilot device is in circuit and normal, automatic operation is obtained.

With the lever in the "off" position, the pilot circuit is opened and the motor cannot be started from any other control point. Turning the lever to the "manual" position closes the control circuit direct and the motor will run continuously regardless of any other control devices as long as there is operating voltage on the line. The construction is extremely simple. It consists of a two button switch inside the case, the buttons of which are operated by a cam attached to the operating lever. The lever will remain in any one of the three positions.

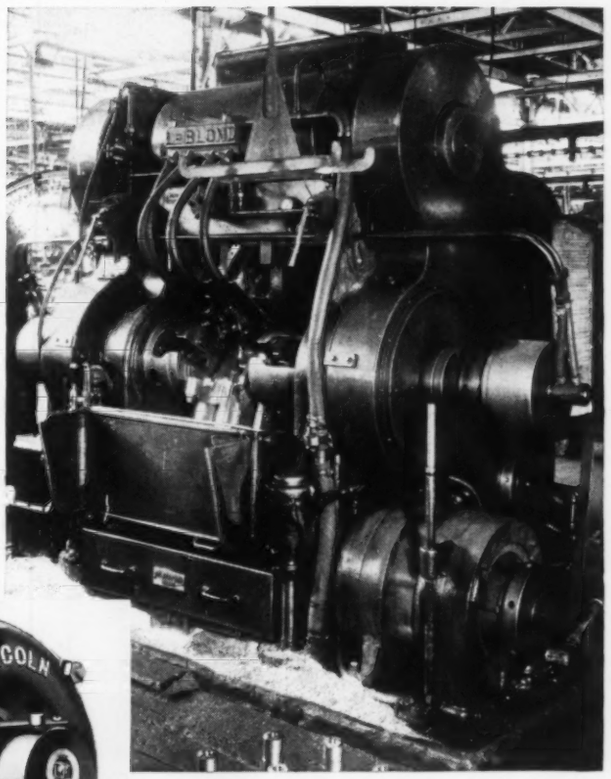
Introduces New Patented Material

CUPAL metal made under a patented process of welding together copper and aluminum sheets, recently was introduced in this country by Ambold Machine Tool Corp., New York. The material originated in Germany. The hardness of the metal varies according to specifications. Copper may be coated on one or both sides of the aluminum sheets or vice versa. The thickness of the metals is variable, depending upon the use of the finished product. Available in sheets, disks and strips, it is being produced in four standard combinations of hard and soft qualities or according to specifications. It can be formed readily in the cold state and the copper coated sides permit plating or soldering.

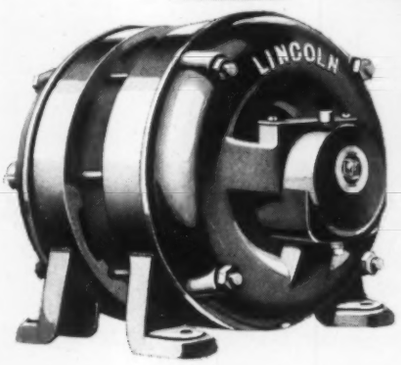
Develops Two New Motor Starters

TWO new starters, the class 8531 alternating current two-pole and the class 8731 direct current two-pole for across-the-line starting of small motors recently were announced by the Industrial Controller division of the Square D Co., Milwaukee. Starters have silver contact points, a floating contactor armature and are

TRADITION



PROGRESS



• Le Blond lathe powered by Lincoln "Linc-Weld" motor, in plant of large motor car manufacturer. •

"YOU'LL be glad to know that the order has finally been placed for the big new machines. It has taken a long time to decide which make was best for our purpose but now all that remains is the simple matter of ordering some motors to drive them and we'll be all set."

"That's one way of looking at it . . . care on machine selection and *don't* care on motor choice.

That's the way one motor car builder looked at it until motor shutdowns called his attention to some things.

They tried out a 'Linc-Weld' motor on a Le Blond lathe for turning crank shafts.

Since then there has been no forced shutdowns on this lathe.

For more than a year the 'Linc-Weld' motor has been stopped and started 17 times every working hour . . . and HOW.

When they stop the motor, they STOP it . . . for as soon as the turning operation is completed, the motor is automatically thrown into the reverse direction to stop it.

Did I hear you say 'Magical results'? Not at all. 'Linc-Weld' is built for that service. No magic to it . . . just superior design (on three counts) and superior construction of STEEL."

THE LINCOLN ELECTRIC COMPANY
DEPARTMENT NO. 37-10 ◆ CLEVELAND, OHIO

M-77

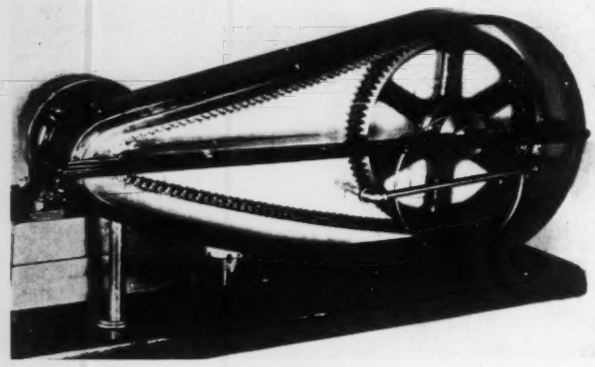
LINCOLN
"LINC-WELD" MOTORS

provided with two-pole double break contacts. The overload relay is of the thermal time limit type with external reset button in the cover. Low voltage release is provided with two-wire control and low voltage protection is provided with three-wire control.

These starters are made in the type B-1 for two or three-wire control and type C-1 for two-wire control with a three point switch in the cover for manual, off and automatic operation.

Develops Automatic Ring Oiler

RECENT development in chain drive lubrication is an automatic ring oiler shown in the accompanying illustration. Running of chain drives in oil baths is not considered advisable by the manufacturer of this oiler, the Morse Chain Co., Ithaca, N. Y., unless the speed is slow, as the oil is churned into a mist which may seep out through the case. This churning also oxidizes the oil more rapidly. The oil and the mechanical parts become heated to an undesirable degree, it is stated, as the oil prevents rapid radiation of heat from the moving parts.



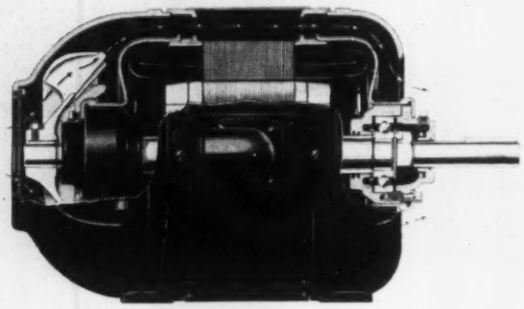
Ring oiler for automatic lubrication of chain drive travels in groove

When run in an oil bath, any dirt in the oil may be carried up with the oil and may cause unnecessary abrasion on the chain and sprockets. The ring oiler is designed so that only clean oil is carried up and into the chain. The ring is made from rod steel and the ends sweated together. This ring travels in a groove turned in the hub of one of the sprockets. The oil is taken off the ring by a wiper. From the wiper it is carried in a pipe to near the center of the chain, where it is dropped on the inside of the chain.

Enclosed Motor Has External Fan

A NEW line of dust-tight, totally enclosed fan-cooled induction motors recently were announced by General Electric Co., Schenectady, N. Y. These units are totally enclosed and equipped with ball bearings, in convenient "cartridge" housings and utilize a single ventilating fan located outside the enclosure proper

Size and weight are minimized in the new motors. The single ventilating fan is located outside the motor enclosure on a short shaft extension and on the end opposite the drive end. A double frame is used, providing air passages for the ventilating air. All enclosing parts are of substantial steel or cast-iron construction. The fan is housed in a cast-iron enclosure with a heavy screen guarding the large opening for the intake. The air is blown through the ventilation passages and out the drive end.



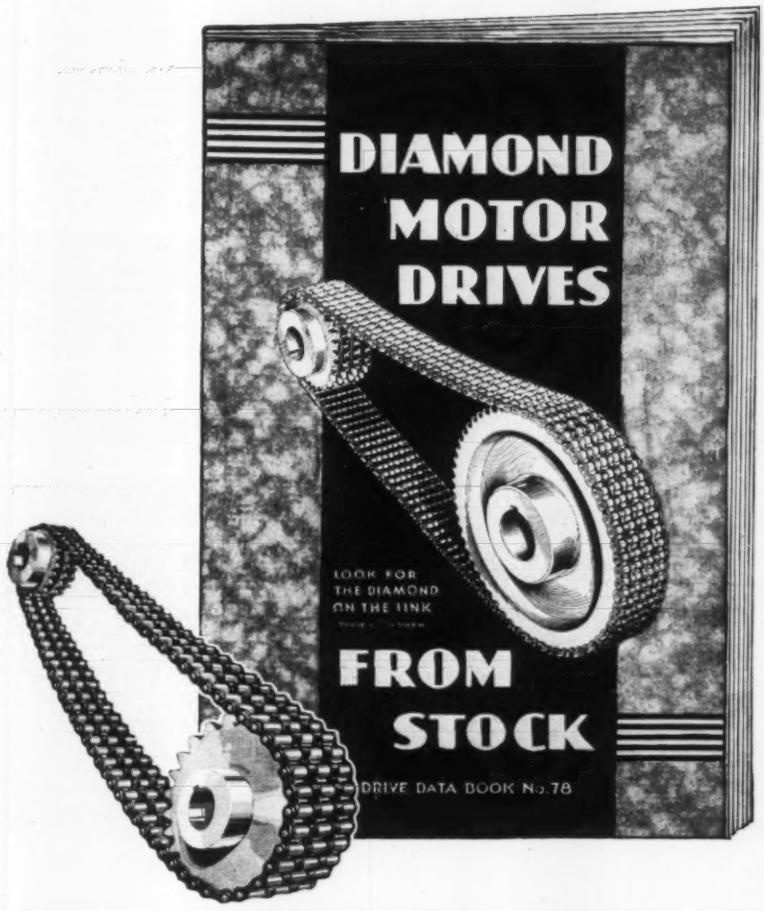
Totally enclosed, fan-cooled induction motor showing path of air currents

Any necessary disassembly or reassembly of the motor is facilitated by the simplified mechanical construction. Dust-tight, cartridge type ball bearing housings are a further aid in this respect and permit removal of the rotor without exposing the bearings to dust or dirt.

Solves Engineering Problems

ELIMINATION of complex algebraic processes involving integration and differentiation by a direct mechanical method is possible through the medium of a new book, "The Mechanics of the Calculus," written by J. M. Barr, Cleveland. The book is accompanied by a set of instruments known as Integraph equipment. It establishes a physical grasp of the principles of mathematics including the calculus, and provides the engineer with a useful tool for design calculation or for review. The work has had the collaboration of well known educators and industrialists.

In Mr. Barr's book integrals and derivatives are brought into existence mechanically and their relations discussed in a fundamental manner. Thus consideration of elastic structures, tractive effort, work, and velocities as the result of accelerative forces all are given treatment. The use of the Integraph for developing integrals and the differentiator for the converse operation are illustrated fully.



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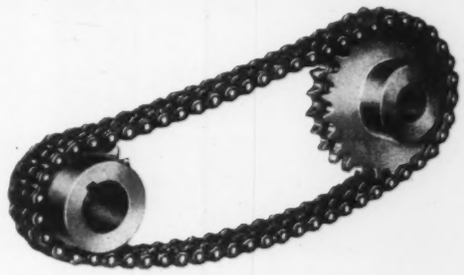

DIAMOND MOTOR DRIVES

Ask for Drive Data Book No. 78

The Diamond Chain & Mfg. Co. now adds convenience of ordering and stock delivery to the many advantages that have placed Diamond Roller Chain Drives in 112 Major Divisions of American Industry.

Now you can order any DIAMOND ROLLER CHAIN DRIVE from 1/4 to 75 horse power, in ratios up to 8.4 to 1, in motor-speeds up to 1800 R.P.M. . . . from the nearest Diamond distributor and get immediate delivery.

Complete and detailed specifications of Diamond Stock Drives are given in the Stock-Drive Book just published. It is a simple matter to select the drive suitable for the application you have in mind—all the "figure work" has been done—you need only turn to the right page.

The book—your phone—(or a telegram) will make immediately available a drive to fit practically any need you may have. Send for *Drive Data Book No. 78* on Diamond Stock Drives. Use the coupon reminder.

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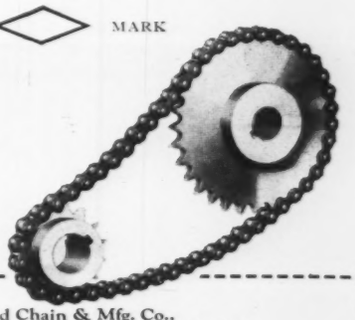

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ASSETS TO A BOOKCASE

Review of Books Pertaining to Design

Kinematics in Design

Engineering Kinematics, by William G. Smith; cloth, 343 pages, 6 x 9 inches; published by the McGraw-Hill Book Co., Inc., New York, and supplied by MACHINE DESIGN for $3.50 plus 15 cents postage.

Fundamental principles of motion, its laws, conversion and transfer are presented by the author in the new second edition of this book. The application of these principles to design of the innumerable devices of transmission, transportation and production are comprehensively covered in the text. Rewriting of a large portion of the text has enabled the author to increase problems and illustrations and include recent developments in the field.

Impetus in activity shown by industrial concerns in their research, development and design departments prompted the author to revise the initial work, which now stresses the increasingly important part kinematics is playing in design of machinery. Material has been gathered from practical sources and the close and obvious relation of the text matter of this book to actual engineering problems and conditions is expected to win the interest of readers more than it would if cases were presented only in the abstract.

Problems given at the close of each chapter are varied and in most cases a typical example with complete information first is shown, followed by one with blank spaces for data. Subjects interestingly covered include friction transmission, toothed gearing for parallel shafts, gears on non-parallel shafting, gear trains, cams, linkwork, belt, rope and chain transmission, devices and attachments to supplement standard transmissions.

□ □ □

A Book for Inventors

Inventions and Patents, by Milton Wright; cloth, 225 pages, 5½ x 8 inches; published by the McGraw-Hill Book Co., Inc., New York, and supplied by Machine Design for $2.50 plus 15 cents postage.

Since it is said that more than three-fourths of the industrial wealth of the nation is founded directly or indirectly upon patent rights, a book covering this subject should capture attention. Moreover, this country seems to possess a stimulus toward invention for which patents sooner or later are sought, and in view of this the author has written his book to guide the inventor down the long winding road to a patent.

After the invention has been conceived there are patent rights to be obtained, pitfalls to be avoided, business opportunities to be sought and handled in certain ways. All these present themselves before the vision of reward becomes a reality.

Chapters on such topics as choosing a patent attorney, the inventor and his employer, finding a buyer, infringement, and how to raise capital are significant of the contents of the book. Putting an invention through the paten office, is another subject discussed to advantage from the standpoint of the new inventor. Traps set for patentees are outlined to show how cunningly sharks set out to capture their prey. Whether or not the reader is contemplating a patent, the book, although not new, offers a vast amount of interesting information that warrants the time spent in perusing the volume.

□ □ □

Discusses Fundamentals

Spur Gears, by Earle Buckingham; cloth, 451 pages, 6 x 9 inches; published by McGraw-Hill Book Co. Inc., New York, and supplied by MACHINE DESIGN for $5.00 plus 15 cents postage.

With his aim directed to bring out as clearly and simply as possible the fundamental characteristics of spur gears, Prof. Buckingham has written his book in the hope that more effective use may be made of the facilities now available for producing this type of gearing.

In this volume the author has attempted to give a complete mathematical exposition of this subject and at the same time to include in the text sufficient explanation in order that the reader may grasp the problems without following through all the mathematical proofs. To accomplish this end many tables have been included, which simplify the use of the material.

The book discusses such topics as gear tooth action, the involute curve and its properties, gear tooth loads, strength and durability of gear teeth, and measuring, hobbing, shaping and grinding of gears. Illustrations supplement the text and add to the comprehensiveness of the contents. Designers will find much of value in this book to add to their store of knowledge.

BUY WITH CONFIDENCE WHEN YOU SEE THIS MARK

Building a Sales Asset for Machinery Builders

This advertisement is typical of the Cutler-Hammer campaign addressed to buyers of your machines. It stresses the value of Motor Control on industrial equipment—builds acceptance for Cutler-Hammer Motor Control as a mark of good machines—creates a ready-made sales asset for you. Every month your customers are told this story in the American Machinist, Electrical World, Mill & Factory Illustrated, Machinery, Factory & Industrial Management. An interlocking campaign also appears in the Saturday Evening Post, Nation's Business, Time and Electrical World.

THERE is a mark which will help guide you in your selection of good machinery. Borrowed from another manufacturer, yet it is nonetheless indicative of the quality of the machine on which it is placed. Look for this mark—"C-H"—on the Motor Control of the machine which you contemplate purchasing. It is worth while . . . because Cutler-Hammer Motor Control is evidence that the manufacturer of the machine knows not only his own business but yours as well . . . that he realizes thoroughly your problems and has done his best, regardless of cost, to solve them.

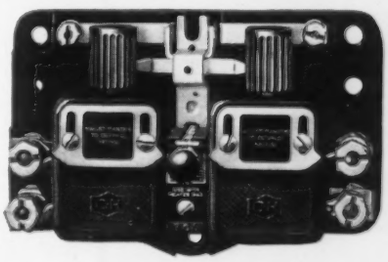
The mark, "C-H", on Motor Control means the motor will be protected against unnecessary interruptions, yet protected fully against damaging overloads. The machine and its operator are protected . . . the full economy of electric power in saving labor, time and cost is made available to you.

Cutler-Hammer Motor Control is incorporated as part of many successful motor-driven machines . . . and is available for every motor in your plant . . . from the largest to the smallest . . . whether the motor is part of the machine or a separate unit. Leading motor-builders recommend Cutler-Hammer Control; outstanding electrical wholesalers in principal centers stock it.

MORE USABLE H. P.

The Cutler-Hammer Thermal Overload Relay protects motors so accurately against overloads that heavier loads are handled with safety. And its accuracy is permanent.

Nothing to replace after tripping . . . just press reset button to put motor back in service. It is used on the entire C-H Standard Line of Automatic Starters.



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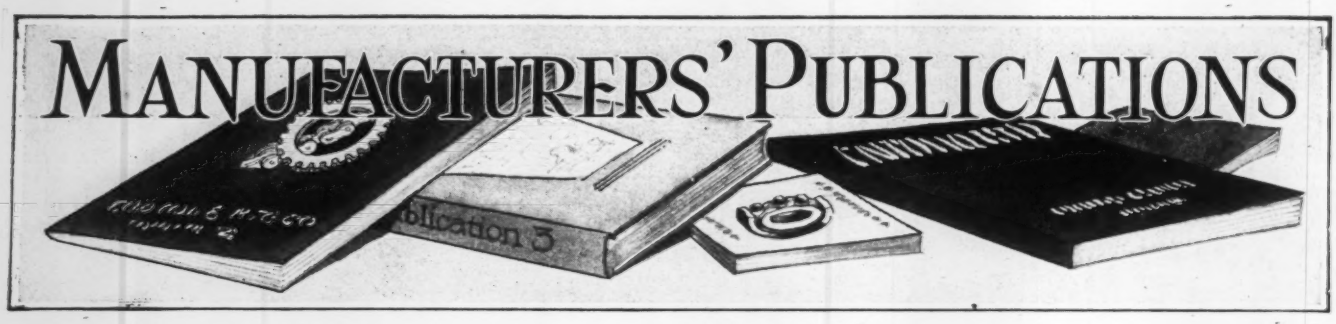
MANUFACTURERS' PUBLICATIONS



Publications listed in this section may be obtained without charge from the manufacturers of the products or through MACHINE DESIGN

MOTORS—Master Electric Co., Dayton, O., recently issued an attractive 27-page booklet depicting the scope and facilities of its factory and organization. It is profusely illustrated with views of the plant, which with the supplementary text, provide an interesting picture. Numerous applications of Master motors comprise the concluding pages.

CENTRIFUGAL PUMPS—Chicago Pump Co., Chicago, offers a digest of its line of centrifugal pumps in a current bulletin, showing several pumps and various applications. Another bulletin covers its vacuum pump and points out important points of design which give it efficiency.

SAFETY NUTS—Kraberhall Inc., Philadelphia, recently published a folder describing and illustrating its safety nuts. They are recommended for railroad, automotive, and machine work or any application where nuts are used.

ELECTRIC EQUIPMENT—Allen-Bradley Co., Milwaukee, announces in a bulletin addition of a new type of pressure switch of small dimensions. The bulletin is illustrated.

FLEXIBLE COUPLINGS—A folder describing Davis flexible couplings, Everlast rail bonds, take-up connectors for trolley wire, combination trolley frogs and line section switches recently was issued by Penn Machine Co., Johnstown, Pa., and Huntington, Pa. It is illustrated.

ACIDPROOF PIPE—American Manganese Steel Co., Southern Manganese Division, St. Louis, is distributing a bulletin carrying test reports of its acid-resisting pipe and fittings, with suggestions as to economy in use of this material in various ways.

V-BELT DRIVE—Medart Co., St. Louis, has published a bulletin covering its V-belt drive. It describes the development and application of this form of drive and discusses the subject of efficient power transmission. Data tables and price lists are given.

ELECTRIC MOTORS—General Electric Co., Schenectady, N. Y., has issued a bulletin on one type of its direct-current motors for moderate or heavy duty. It follows the usual style of the company's descriptive bulletins, with illustrations of details and full description.

ROLLER BEARINGS—Bulletin Q containing 14 pages and devoted to the application of Hyatt roller bearings to pulp and paper machinery, recently was issued by Hyatt Roller Bearing Co. Illustrations supplement the text to give the reader a comprehensive understanding of the subject.

INGOT METALS—A booklet is being distributed by Tottenville Copper Co. Inc., New York, which furnishes consumers of nonferrous ingot metals with a list of various standard formula ingots this company produces. Description relative to their chemical and physical properties, applications, etc., also is given. In addition the text outlines the company's facilities as applied to the production of special alloys.

SPEED TRANSMISSION—Reeves Pulley Co., Columbus, Ind., describes in a current bulletin its variable speed transmission with electric automatic control and electric remote control. It is illustrated and full description is given of its construction and operation.

STEEL CASTINGS—Lebanon Steel Foundry, Lebanon, Pa., in a current bulletin stresses the degree of safety its steel castings give to transportation units.

PROTECTIVE COATINGS—Headley Emulsified Products Co., Philadelphia, in two current bulletins describes its waterproofing and damp-proofing compounds and its asphalt-base aluminum coating.

MOTORS—Louis Allis Co., Milwaukee, recently issued a 6-page folder describing its type J totally enclosed, fan-cooled motor. Illustrations showing the parts and construction of the unit augment the text matter.

SPECIAL SHEET STEELS—Superior Sheet Steel Co., division of Continental Steel Corp., Canton, O., in a current bulletin seeks to indicate some of the varied uses to which its special sheets are being put by manufacturers seeking a lasting material that will stand time and wear. It is well illustrated.

HERRINGBONE GEARS—A 12-page booklet describing the various applications of herringbone gears manufactured by General Electric Co., Schenectady, N. Y., recently was issued by that company. Illustrations of units utilizing this type of gearing, are shown throughout the publication.

VALVES—Bulletin No. 141 which describes and illustrates Jenkins standard bronze valves, recently was issued by Jenkins Bros., 80 White street, New York. The valves covered in the text are made in globe, angle, cross and check types for all standard services. The one-piece screw-over bonnet and slip-on stay-on disk holder are features of the new product.

ELECTRIC STEEL—Electric steel produced in an induction furnace is discussed in a bulletin by the Heppenstall Co., Pittsburgh. The subject of steels produced in this type of furnace is discussed at length.

LUBRICATION—Low viscosity lubrication is discussed in the current issue of the Texas Co.'s publication on lubrication. The text treats of the relation of its economy

in power consumption and discusses the subject as applied to street railways, textile machinery, turbine bearings, the ceramic industry and general machinery.

STEEL CASTINGS—Industrial Steel Casting Co., Toledo, O., in a current bulletin stresses the advantages of steel castings and tells of the care used in its foundry to produce castings of high grade.

DEOXIDIZER—Vanadium Corp. of America, New York, features in a current bulletin its steel deoxidizer composed of aluminum, silicon and iron. Its advantages and proper application are described.

WIRE TABLES — Tables of strength of its copper welded wire have been published by the Copperweld Steel Co., Glassport, Pa. The tables show breaking strength in pounds of various types of wire, loading tables and tables for cables.

LUBRICATION—Borne Scrymser Co., New York, presents claims for its lubricating devices in two current bulletins which go into considerable detail on the applications of its universal compressor and lubricators as applied to industrial equipment.

ROTARY COMPRESSORS—Yeomans Bros. Co., Chicago, has issued a catalog on its rotary compressors and dry vacuum pumps, with illustrations, cross sections and tables of data. Various advantages of this type of compressor are indicated and a wide variety of uses is listed.

CHAIN—Silent and roller chain manufactured by the Union Chain & Mfg. Co., Sandusky, O., is described in a catalog just issued. Data on these types of chain are supplemented by engineering tables of use to chain users. It also contains data on sprockets and chain attachments for special purposes.

ARC WELDING—Lincoln Electric Co., Cleveland, has issued a booklet on automatic welding with the carbon arc. It contains much information and describes in detail advantages of this process. Results of test of strength and ductility are tabulated and described and tests by the laboratory of the Lincoln company are included.

DIE CASTINGS—New Jersey Zinc Co., New York, recently issued an attractive booklet describing the use of its zinc base alloys in die castings. Numerous illustrations are shown to give the reader a broad understanding of various products made from Horsehead zinc alloys. Data covering analyses and tensile strength are included in the text.

SPEED REDUCERS—Catalog No. 25 describing its complete line of speed reducers of small and fractional horsepower capacity recently was issued by Winfield H. Smith Inc., Springville, N. Y. Units equipped with ball and roller bearings are shown along with the company's line of light power transmission machinery, grooved pulleys and small hangers, pillow blocks, collars and couplings.

FLEXIBLE COUPLINGS—Westinghouse Electric & Mfg. Co., Nuttall Works, Pittsburgh, has issued a bulletin on its flexible couplings of various types for steel mill machinery. The several types are illustrated and data are given to guide in selection of the proper coupling for a given installation. Another bulletin from the same source relates to speed reducers, containing descriptions and illustrations of the reducers and applications to various uses.

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MEN OF MACHINES

(*Concluded from Page* 58)

chols became associated with the Bell Telephone Laboratories, which connection he severed to accept his present position.

* * *

James W. Owens, director of welding for the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., has resigned to become director of engineering for the Welding Engineering & Research Corp., New York.

* * *

John M. Watson, vice president of the American Society for Steel Treating, has been nominated for president of the society for 1931. Mr. Watson is metallurgical engineer of the Hupp Motor Car Corp., Detroit.

* * *

Joseph P. Taylor has retired after a connection with the Midvale Co., Philadelphia, dating back to 1898, latterly as consultant in machine shop practice. He was graduated from Worcester Polytechnic institute in 1891 and spent several years in the shops of the Michigan Central railroad.

Obituaries

DANIEL Guggenheim, known as the foster father of aviation, died at his home at Sands Point, Long Island, New York, September 28. He was 74 years old. Although Mr. Guggenheim gave millions to philanthropic endeavors, the crowning activity of his later years was his generous endowments to aviation. It is estimated that he spent over $5,000,000 in this field, one of his outstanding contributions being the $100,000 prize awarded the Curtis Tanager in the safe aircraft contest. Mr. Guggenheim's record shows that he was the guiding genius in some of the largest industrial enterprises in the history of the country, notably the American Smelting & Refining Co. which he served as president for 20 years.

* * *

William Gutenkunst, 80, founder and president, Milwaukee Hay Tool Co., and president, Milwaukee Malleable & Gray Iron Foundry Co., Milwaukee, died there Aug. 23. He was born in Milwaukee July 7, 1850. Mr. Gutenkunst was the inventor and designer of numerous items of farm machinery. He was a director of Wisconsin State bank, Milwaukee.

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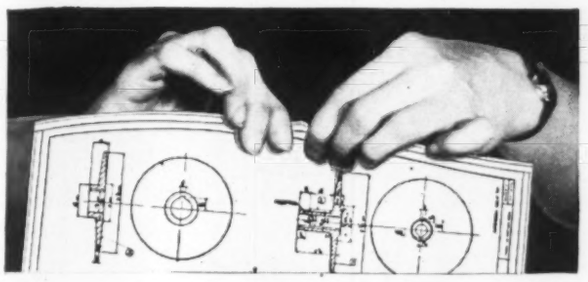

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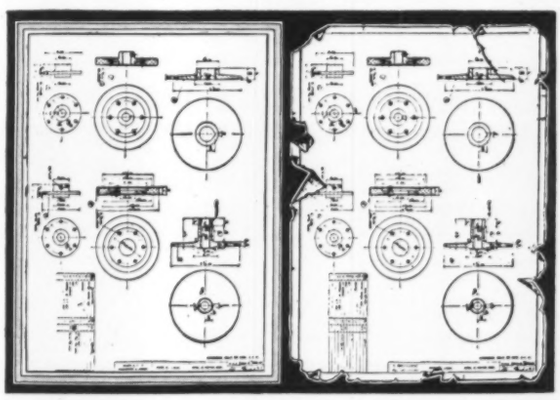

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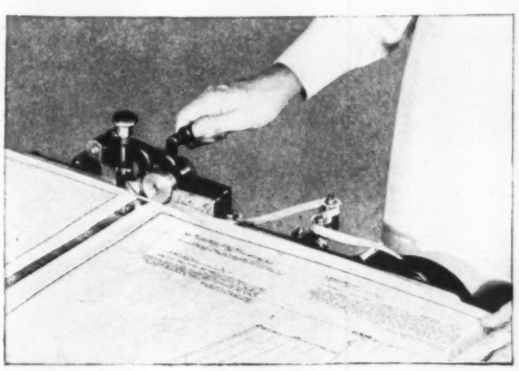

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